04-SCl-101 PM 16.0/52.55
04-SCl-85 PM 23.0/24.1
EA 04-2G7100

US 101 Express Lanes Project
Santa Clara County, California

Water Quality Study Report

Prepared for:

Caltrans

VTA

URS

Prepared by:

WRECO

May 2013

04-SCl-101 PM 16.0/52.55
04-SCl-85 PM 23.0/24.1
EA 04-2G7100

US 101 Express Lanes Project
Santa Clara County, California

Water Quality Study Report

Submitted to:
Santa Clara Valley Transportation Authority and California Department of Transportation

This report has been prepared by or under the supervision of the following Registered Engineer. The Registered Civil Engineer attests to the technical information contained herein and has judged the qualifications of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.

Analette Ochoa
____
Analette Ochoa, P.E.
Registered Civil Engineer

5/10/13
____
Date

May 2013

Table of Contents

Figures

Tables

Photos

Appendices

Executive Summary

Santa Clara Valley Transportation Authority (VTA), in cooperation with the California Department of Transportation (Caltrans), proposes to convert the existing High-Occupancy Vehicle (HOV) lanes along the United States Highway 101 (US 101) to High-Occupancy Toll (HOT) lanes (hereafter known as express lanes) and add a second express lane in each direction on northbound and southbound US 101 within the overall project limits of East Dunne Avenue interchange in Morgan Hill to the Santa Clara/San Mateo County line just north of the Oregon Expressway/Embarcadero Road interchange in Palo Alto. The express lanes will allow HOVs and eligible clean air vehicles to continue to use the lanes for free and eligible single-occupant vehicles (SOVs) to pay a toll. The project will also convert the US 101/State Route (SR) 85 HOV direct connectors in Mountain View to express lane connectors and restripe the northern 1.1 mile of SR 85 to introduce a buffer separating the mixed flow lanes from the express lane and connecting the SR 85 express lanes to the US 101 express lanes. The project length is 36.55 miles on US 101 and 1.1 miles on SR 85, for a total of 37.65 miles.

The purpose of this Water Quality Study Report is to evaluate the potential for water quality impacts to existing surface water and/or groundwater resources within the project limits due to the proposed project improvements. The general approach of the project is to avoid or minimize impacts and to implement mitigation measures for any unavoidable impacts. This study considered all proposed project activities that may result in impacts to water resources, erosion of stream banks, and an increase in sediment load and other pollutants to surface and groundwaters.

The US 101 Express Lanes Project (Project) is within both the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) and the Central Coast Regional Water Quality Control Board (CCRWQCB) jurisdictions. There are a total of 15 waterway crossings in the project limits, which include 12 creeks: Coyote Creek, Upper Silver Creek, Lower Silver Creek, Guadalupe River, San Tomas Aquino Creek, Calabazas Creek, Sunnyvale East Channel, Sunnyvale West Channel, Stevens Creek, Permanente Creek, Adobe Creek and Matadero Creek. Coyote Creek crosses US 101 four times. All the waterways crossing within the project limits ultimately discharge to the San Francisco Bay. The southernmost portion of the project, from Dunne Avenue to Cochrane Road, is within the CCRWQCB. Flow from this area drains into Madrone Channel, which flows south toward Llagas Creek and eventually into Monterey Bay.

A total of 13 receiving water bodies have been identified for the project: 12 creeks for the San Francisco Bay and one channel for the Monterey Bay. Of the 12 water bodies associated with the San Francisco Bay, eight water bodies are on the Clean Water Act's 303(d) list (2010) for Water Quality Limited Segments: Coyote Creek, Silver Creek (both upper and lower), Guadalupe River, San Tomas Aquino Creek, Calabazas Creek, Stevens Creek, Permanente Creek, and Matadero Creek. San Francisco Bay, South, the ultimate receiving water body for these creeks, is also on the 303(d) List. For the Central Coast, Llagas Creek is on the 303(d) list (2010) for Water Quality Limited Segments. All other receiving water bodies are not listed in the 2010 Integrated Report (Clean Water Act Section 303[d] List / 305[b] Report).

According to the project's Preliminary Geotechnical Report (PGR), groundwater has been detected at depths averaging between 2 and 6 feet below ground surface (bgs) in Mountain View at the northern end of the study area, to depths of up to 10 and 20 feet bgs near Morgan Hill at the southern end of the study area. The project extends through various groundwater sub-basins, based on the San Francisco Bay and Central Coast RWQCB Basin Plans. The majority of the project is within the Santa Clara Valley Basin, and a small southern portion of the project is in the Gilroy-Hollister Valley Basin. The groundwater beneficial uses corresponding to both the Santa Clara Valley Basin and Gilroy-Hollister Valley Basin are Municipal and Domestic, Industrial Service and Agricultural Water Supply; these are detailed in Section 3.9 of this report. Based on United States Geological Survey topography maps and Natural Environmental Study Report (URS 2013), there are five perennial streams: Stevens Creek, San Tomas Aquino Creek, Guadalupe River, Silver Creek and Coyote Creek.

The project proposes widening along some of the bridges, and based on the PGR (URS 2013), the groundwater table is anticipated to be encountered due to the excavation of the proposed retaining walls and bridge widenings (which are not proposed over creeks); therefore, dewatering may be necessary at these locations. Dewatering needs and methods to address dewatering will be determined during the design phase. Temporary Best Management Practices (BMPs) will be considered for this project to prevent potential water quality impacts during construction.

Stormwater runoff from the project corridor potentially carries pollutants into natural flowing streams as well as into adjacent jurisdictional biotic/aquatic areas. Permanent BMPs will be considered to address these impacts, promote infiltration, reduce erosion, and collect and treat roadway runoff. Potential types of BMPs to be considered for this project are listed in the "Permanent Pollution Prevention Design Measures" section of this report.

The SFBRWQCB's *Memorandum of California Department of Transportation Post-Construction Stormwater and Hydromodification Standards* (July 2008) requests Caltrans to comply with the SFBRWQCB Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (MRP). The project is located within the jurisdiction of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), which is a member agency covered under the MRP. As a portion of the project lies in an area that is susceptible to hydromodification impacts, measures will be designed to meet the hydromodification mitigation requirements set forth in the MRP. The project will not affect stream or riparian habitats, or wetlands or waters of the United States.

The project's overall design goal will be to avoid impacts to water resources to the maximum extent practicable, promote infiltration of stormwater runoff, maximize treatment of stormwater runoff, and reduce erosion by metering or detaining post-project runoff rates to meet the hydromodification mitigation requirements. By meeting these goals and incorporating applicable NPDES requirements, water quality impacts should be minimized and therefore, there would be no significant impacts due to the project.

Acronyms

ABAG	Association of Bay Area Governments
BAHM	Bay Area Hydrology Model
BATEA	Best Available Technology Economically Achievable
BCT	Best Conventional Technology
bgs	Below Ground Surface
BMPs	Best Management Practices
BSA	Biological Study Area
Caltrans	California Department of Transportation
CCRWQCB	Central Coast Regional Water Quality Control Board
CDFW	California Department of Fish and Wildlife
CGP	Construction General Permit
CWA	Clean Water Act
DSA	Disturbed Soil Area
EPA	Environmental Protection Agency
EPA	Environmental Protection Agency
ESA	Environmental Sensitive Area
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRMs	Flood Insurance Rate Maps
GIS	Geographic Information System
HMP	Hydromodification Management Plan
HOV	High Occupancy Vehicle
I-280	Interstate 280
LOS	Level of Service
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
NOC	Notice of Construction
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PS&E	Plans, Specifications, and Estimates
RCB	Reinforced Concrete Box
RWQCB	Regional Water Quality Control Board
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SCVWD	Santa Clara Valley Water District
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SOV	Single-Occupant Vehicle
SMARTS	Storm Water Multiple Application and Report Tracking System
SR	State Route
SWMP	Storm Water Management Plan
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TMDL	Total Maximum Daily Load
US 101	United States 101
USACE	United States Army Corps of Engineers
VPH	Vehicles Per Hour
VTA	Santa Clara Valley Transportation Authority
WDR	Waste Discharge Requirements

1 GENERAL DESCRIPTION

Santa Clara Valley Transportation Authority (VTA), in cooperation with the California Department of Transportation (Caltrans), proposes to convert the existing High-Occupancy Vehicle (HOV) lanes along the United States Highway 101 (US 101) to High-Occupancy Toll (HOT) lanes (hereafter known as express lanes) and add a second express lane in each direction on northbound and southbound US 101 within the overall project limits of East Dunne Avenue interchange in Morgan Hill to the Santa Clara/San Mateo County line just north of the Oregon Expressway/Embarcadero Road interchange in Palo Alto. The express lanes will allow HOVs and eligible clean air vehicles to continue to use the lanes for free and eligible single-occupant vehicles (SOVs) to pay a toll. The project will also convert the US 101/State Route (SR) 85 HOV direct connectors in Mountain View to express lane connectors and restripe the northern 1.1 mile of SR 85 to introduce a buffer separating the mixed flow lanes from the express lane and connecting the SR 85 express lanes to the US 101 express lanes. See Figure 1 for a project Vicinity Map and Project Location Map. The project length is 36.55 miles on US 101 and 1.1 miles on SR 85, for a total of 37.65 miles.

This Water Quality Study Report presents potential water quality impacts to existing surface and groundwater resources within the project limits.

1.1 Project Description

The project consists of converting the existing HOV lane along both northbound and southbound US 101 into an express lane and widening the freeway to add a second express lane for the majority of the corridor. The project also proposes to build new express lanes in the northbound direction between East Dunne Avenue and the existing HOV lane at Cochrane Road, and in the southbound direction between Burnett Avenue and East Dunne Avenue.

With these changes, there would be two express lanes on US 101 extending from approximately the Cochrane Road interchange in Morgan Hill to just south of the Oregon Expressway/ Embarcadero Road interchange in Palo Alto in the northbound direction, and from just south of the Oregon Expressway/Embarcadero Road interchange to just north of East Dunne Avenue in the southbound direction.

Two alternatives are proposed: the Build Alternative and the No Build Alternative. The No Build Alternative assumes no modifications would be made to the current US 101 corridor, including the continuous access HOV lane, other than routine maintenance and rehabilitation of the facility and any currently planned and programmed projects within the area.

1.1.1 Build Alternative

The addition of the second express lane will involve a combination of inside and outside widening. The majority of the inside widening will occur within the US 101 segments south of the SR 85/US 101 interchange in southern Santa Clara County where a wide unpaved median exists. The project proposes to widen and pave the median to accommodate the additional lanes. The outside widening will occur in the remainder of the corridor to accommodate the additional lanes where needed.

The express lanes facility would be separated from the adjacent mixed-flow lanes by a striped buffer. The buffer zone, delineated with solid stripes, will have designated openings to provide access into and out of the express lanes facility. The express lanes would allow HOVs to continue to use the lanes without cost and eligible single-occupant vehicles (SOVs) to pay a toll.

The project proposes to construct and operate the express lane system with some non-standard cross sectional elements which will minimize the need for new right-of-way, outside widening, and structure reconstruction. The proposed project maximizes the use of the existing pavement cross section with a combination of inside and outside widening to create the additional pavement needed to accommodate the second express lane.

1.1.2 Right-of-Way

It is anticipated that the project will require Temporary Construction Easements (TCE). Right of way activities are currently being coordinated based on the approval of design exceptions. Utility relocations are anticipated to accommodate the outside widening.

1.1.3 Construction Activities

In the section between the southern project limit and the SR 85 interchange in southern San Jose, where the median width varies between 46 and 86 feet, pavement widening would be constructed in the median to accommodate the dual express lane facility. A retaining wall in the median is required to accommodate the inside widening where a split profile exists between northbound and southbound US 101. A dual express lane facility is proposed for the majority of the corridor, with the exception of short segments near the SR 85 express lane connectors where a single express lane is proposed. A single express lane is proposed between the SR 85 Interchange and the Blossom Hill Road Interchange in San Jose, and between the Mathilda Avenue interchange and the SR 85 interchange in Mountain View. Outside widening is proposed to accommodate dual express lanes between the Blossom Hill Road interchange and the Mathilda Avenue interchange.

Bridge widening will be required at a number of grade separations and undercrossings, as well as modifications to existing overcrossing abutments, which can be found in Table 1 and 2. Widening of creek bridges is not anticipated at this time pending the approval of non-standard cross sectional features.

Table 1. Proposed Bridge Widening

Bridge No.	Post Mile	Bridge Name	Type of Work
37-344	21.25	Coyote Creek Golf Drive UC	Widen Bridge (Inside)
37-404	21.55	Utility Facility UC (Golf Course)	Widen Bridge (Inside)
37-347	27.01	Bernal Rd UC	Widen Bridge (Inside)
37-108	29.72	Coyote Rd UC	Widen Bridge (Inside and Outside)
37-409	31	Yerba Buena Rd UC	Widen Bridge (Inside and Outside)

Table 2. Proposed Modification to Bridge Abutments

Bridge No.	Post Mile	Bridge Name	Type of Work
37-668	33.03	Tully Rd OC	Modify Abutments
37-222	35.46	San Antonio St OC	Modify Abutments
37-48	35.76	Santa Clara St OC	Modify Abutments
37-123	36.12	Julian/McKee OC	Modify NB Abutment
37-115	37.99	North San Jose UP	Modify SB Abutment
37-118	38.09	10th Street OC	Modify SB Abutment
37-403R	39.90	Route 87/101 SEP	Modify SB Abutment
37-183G	39.91	Jct 87/101 SEP	Modify SB Abutment
37-390	42.73	Bowers Ave OC	Modify Abutments
37-152	43.85	Lawrence Expwy	Modify Abutments

The piles for the overhead signs would be up to 6 feet in diameter and extend to approximately 30 feet below ground surface. The piles for the tolling devices would be up to 2.5 feet in diameter and would extend to approximately 10 feet below ground surface. Some Traffic Operations Systems (TOS) equipment such as traffic monitoring stations, Closed Circuit Televisions, cabinets, and controllers would be installed along the outside edge of pavement within the existing right-of-way.

Trenching would be conducted along the outside edge of pavement for installation of conduits. The depth of trenching would be 3 to 5 feet below the roadway surface. Conduits would be jacked across the freeway to the median where needed to provide power and communication feeds to the new overhead signage and tolling equipment.

During construction, some lane and ramp closures would be required, but full freeway closures are not expected.

Biofiltration devices are proposed to provide storm water treatment for impervious areas that would be added or reworked as part of the project. These devices would be installed within the existing right-of-way.

1.1.4 US 101/SR 85 Direct Connectors

At the south end of the project in southern San Jose, both the northbound and southbound HOV direct connectors from SR 85 to US 101 (PM 26.78) will be converted to express lane connectors by the SR 85 Express Lanes Project, allowing SOVs with valid FasTrak devices to use the direct connectors.

At the north end of the project in Mountain View (PM 48.09), the US 101 Express Lanes Project will convert the existing HOV connectors to express lane connectors and will extend the buffer striping onto SR 85 to connect to the buffer constructed by the SR 85 Express Lanes Project (EA #04-4A7900). The combination of SR 85 and US 101 Express Lanes projects will provide a complete express lane system on both freeways that includes the direct connectors.

1.2 Need for Project

1.2.1 Transportation Demand

In Santa Clara County, US 101 typically has three mixed-flow lanes and a single HOV lane in each direction, with auxiliary lanes (lanes that extend from on-ramps to off-ramps) in some segments. US 101 within the project limits carries up to 256,000 vehicles per day, including HOV traffic (Caltrans 2011).

High transportation demand in several segments of the mixed-flow lanes leads to substantial congestion and reduced speeds for SOVs. During the peak periods (6 a.m. to 9 a.m. and 3 p.m. to 6 p.m.), US 101 cannot accommodate all of the traffic demand in the corridor, causing "bottlenecks" in numerous segments of the mixed-flow lanes. As a result, the mixed-flow lanes function below the posted speed limit in some segments.

In addition to the congestion in the mixed-flow lanes, drivers in the HOV lane also experience delays in some HOV segments on US 101 between SR 85 in San Jose and SR 85 in Mountain View. Assembly Bill 2032 (2004) set the requirement that HOV lanes must operate at a Level of Service (LOS) of at least C or D, which indicates minimal delays and corresponds to a target threshold of approximately 1,650 vehicles per hour (VPH) per HOV lane. The 1,650 VPH threshold is intended to provide HOVs with reliable travel time savings. Other HOV lane segments within the project limits are relatively free from congestion and operate well below the

1,650 VPH threshold. Those HOV segments are currently underutilized and can provide opportunities to maximize the efficiency of the HOV lanes.

1.3 Project History

US 101 in Santa Clara County is a 52.55-mile long freeway that connects Gilroy to Palo Alto. US 101 passes through Gilroy, Morgan Hill, San Jose, Santa Clara, Sunnyvale, Mountain View and Palo Alto. US 101 intersects SR 85 in San Jose and in Mountain View, I-280/I-680, I-880, SR 87, and SR 237. US 101 typically has 4 lanes in each direction, including 3 mixed-flow lanes and 1 HOV lane with auxiliary lanes in some locations.

The proposed project was originally conceived in 2003 as part of a Santa Clara Valley Transportation Authority (VTA) Adhoc Financial Stability Committee recommendation. In 2004, the California Legislature passed Assembly Bill 2032 authorizing the VTA, as part of a demonstration project, to conduct, administer, and operate a value pricing and transit development program under which SOVs may use designated HOV lanes at certain times of the day for a fee. A Feasibility Study was completed in 2005. In 2007, Assembly Bill 574 was passed, removing the “demonstration” category from the law and allowing the VTA to implement a value pricing program within any two corridors in the Santa Clara County HOV lane system.

VTA began preliminary engineering and public outreach in 2007, and the VTA Board approved a Silicon Valley Express Lane Program in December 2008. Work on the development of the US 101 express lanes has been ongoing since 2007. As part of the preliminary engineering work, several express lane access configurations were reviewed, public outreach was conducted, and a technical memorandum was prepared that was used as input for the approval of the Silicon Valley Express Lanes Program by the VTA Board of Directors.

Net revenue generated from the use of the US 101 express lanes will be used in the US 101 corridor for highway improvements including transit service and operations.

1.4 Creek, Stream, and River Crossings

Twelve water bodies cross US 101 within the Project limits, with Coyote Creek crossing the highway alignment at four separate locations. Therefore, there are a total of 15 waterway crossings within the Project limits. Creek crossing drainage systems were located from Federal Emergency Management Agency (FEMA) maps, as-built record drawings, Caltrans Structure Maintenance Logs, aerial photographs and site visits by WRECO staff on January 6 and January 18, 2012. All creeks that pass through the Project limits are maintained by the Santa Clara Valley Water District (SCVWD).

Figure 1 identifies the location and limits of the project. Figure 2 is a map identifying the locations of the waterway crossing and Table 4 identifies the post miles, sizes and crossing types for each waterway crossing.

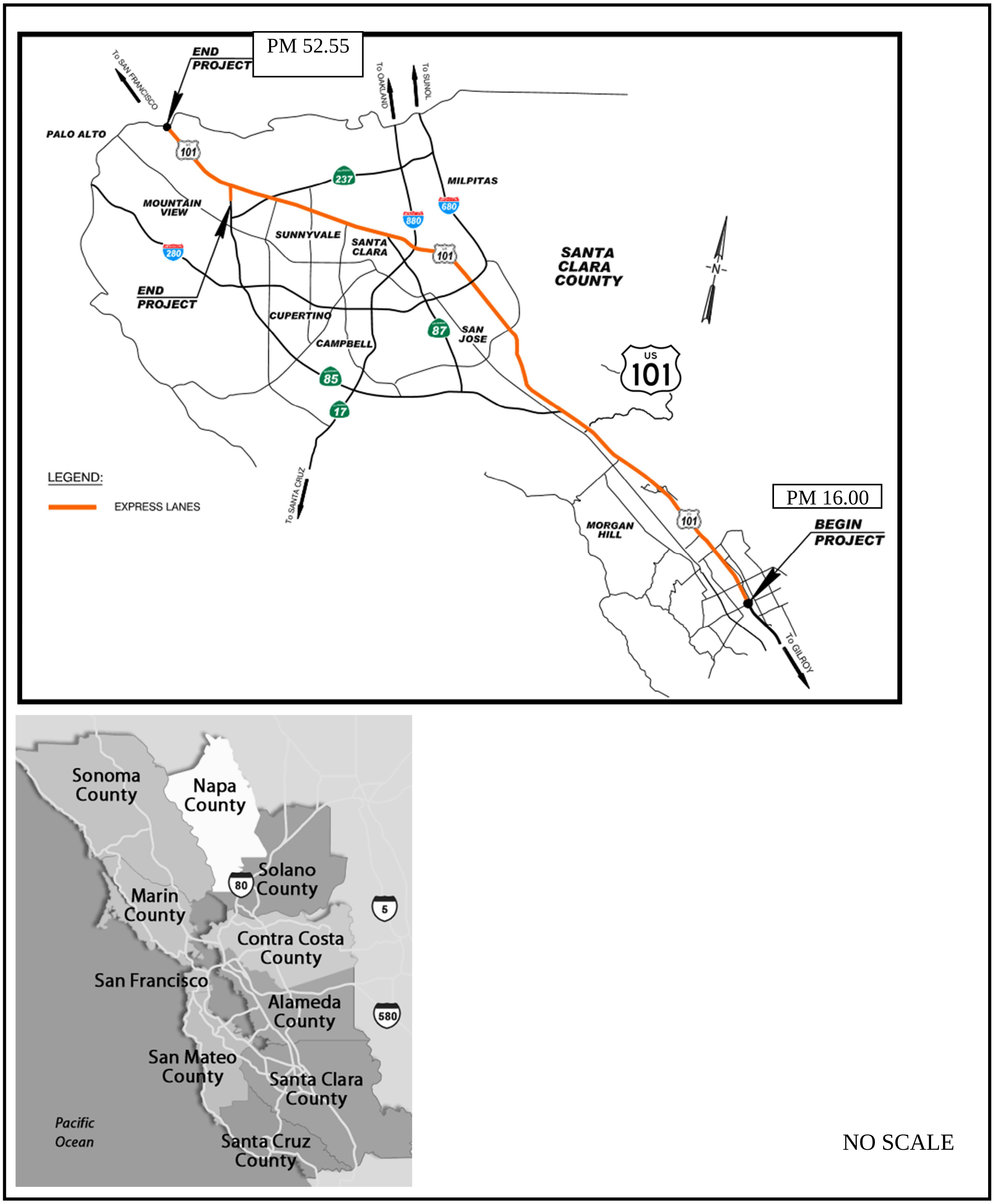


Figure 1. Location Map

Source: URS Corporation (URS)

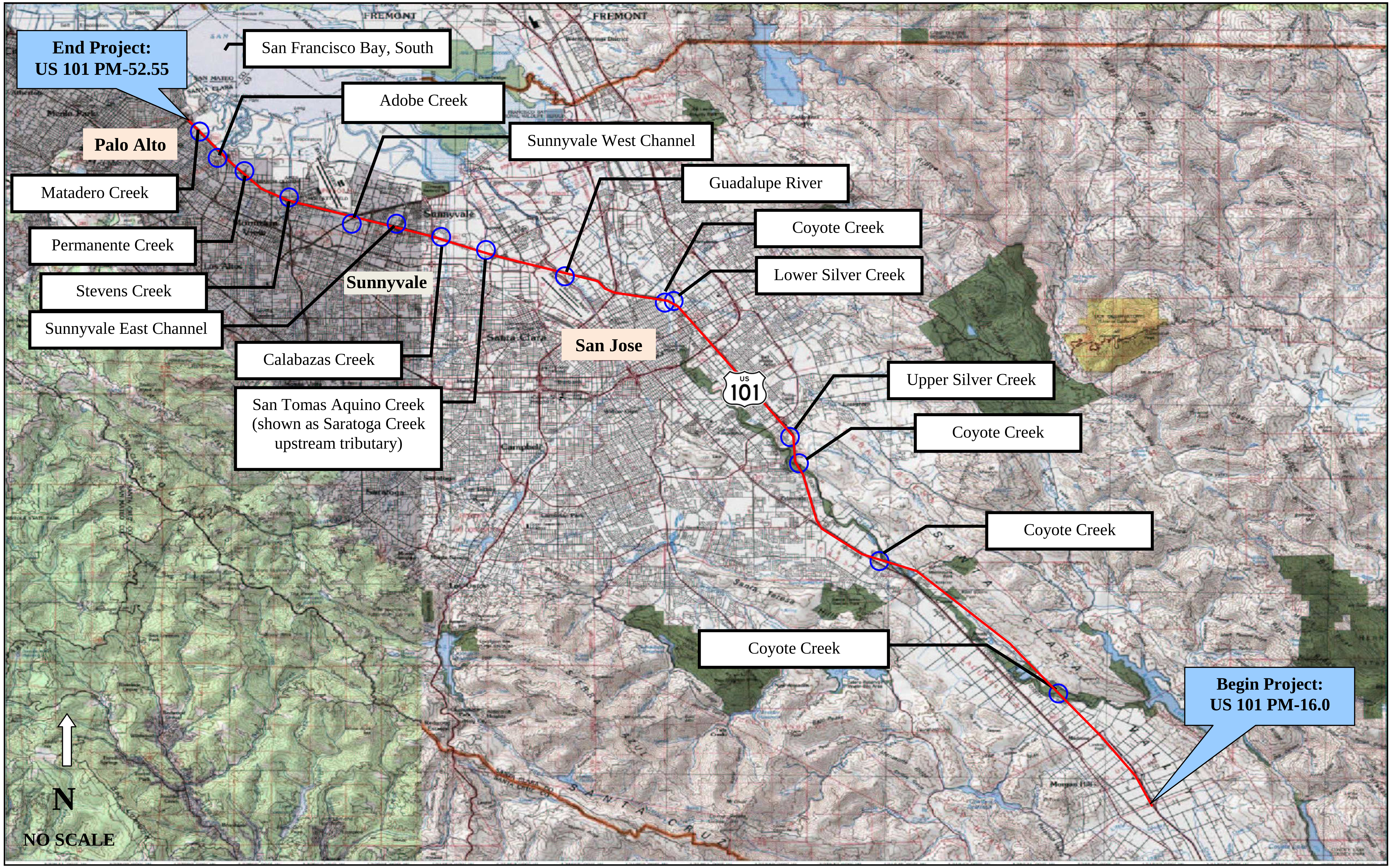


Figure 2. Vicinity Map and Waterway Crossings

Source: USGS

2 REGULATORY SECTION

This section summarizes the regulatory context in which issues associated with water quality are mandated at the federal, state, and local levels.

2.1 Federal Laws and Requirements

2.1.1 Clean Water Act

In 1972 Congress amended the Federal Water Pollution Control Act, making the addition of pollutants to the waters of the U.S. from any point source unlawful unless the discharge is in compliance with an NPDES permit. Known today as the Clean Water Act (CWA), Congress has amended it several times. In the 1987 amendments, Congress directed dischargers of stormwater from municipal and industrial/construction point sources to comply with the NPDES permit scheme. Important CWA sections are:

- Sections 303 and 304 require states to promulgate water quality standards, criteria, and guidelines.
- Section 401 requires that an applicant for a federal license or permit for any activity potentially resulting in a discharge to waters of the U.S. must obtain certification from the State that the discharge will comply with other provisions of the act. (Most frequently required in tandem with a Section 404 permit request. See below).
- Section 402 establishes the NPDES, a permitting system for the discharges (except for dredge or fill material) of any pollutant into waters of the U.S. The Regional Water Quality Control Boards (RWQCB) administer this permitting program in California. Section 402(p) requires permits for discharges of stormwater from industrial/construction and Municipal Separate Storm Sewer Systems (MS4s).
- Section 404 establishes a permit program for the discharge of dredge or fill material into waters of the U.S. This permit program is administered by the U.S. Army Corps of Engineers (USACE).

The objective of the CWA is “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.”

USACE issues two types of 404 permits: Standard and General permits. For General permits, there are two types: Regional permits and Nationwide permits. Regional permits are issued for a general category of activities when they are similar in nature and cause minimal environmental effect. Nationwide permits are issued to authorize a variety of minor project activities with no more than minimal effects.

There are also two types of Standard permits: Individual permits and Letters of Permission. Ordinarily, projects that do not meet the criteria for a Nationwide Permit may be permitted under one of USACE’s Standard permits. For Standard permits, the USACE’s decision to approve is based on compliance with the U.S. Environmental Protection Agency’s (EPA) Section 404 (b)(1)

Guidelines (U.S. EPA CFR 40 Part 230) and whether permit approval is in the public interest. The 404(b)(1) Guidelines were developed by the U.S. EPA in conjunction with the USACE, and allow the discharge of dredged or fill material into the aquatic system (waters of the U.S.) only if there is no practicable alternative which will have less adverse effects. The 404(b)(1) Guidelines state that USACE may not issue a permit if there is a least environmentally damaging practicable alternative to the proposed discharge that will have fewer effects on waters of the U.S. and not have any other significant adverse environmental consequences. Per the 404(b)(1) Guidelines, documentation is needed that a sequence of avoidance, minimization, and compensation measures have been followed, in that order. The 404(b)(1) Guidelines also restrict permitting activities that violate water quality or toxic effluent standards, jeopardize the continued existence of listed species, violate marine sanctuary protections, or cause "significant degradation" to waters of the U.S. In addition, every permit from the USACE, even if not subject to the 404(b)(1) Guidelines, must meet general requirements; see 33 CFR 320.4.

2.2 State Laws and Requirements

2.2.1 Porter-Cologne Water Quality Control Act

California's Porter-Cologne Act, enacted in 1969, provides the legal basis for water quality regulation within California. This Act requires a "Report of Waste Discharge" for any discharge of waste (liquid, solid, or gaseous) to land or surface waters that may impair beneficial uses for surface and/or groundwater of the State. It predates the CWA and regulates discharges to waters of the State. Waters of the State include more than just waters of the U.S., like groundwater and surface waters not considered waters of the U.S. Additionally, it prohibits discharges of "waste" as defined and this definition is broader than the CWA definition of "pollutant." Discharges under the Porter-Cologne Act are permitted by Waste Discharge Requirements (WDRs) and may be required even when the discharge is already permitted or exempt under the CWA.

The State Water Resources Control Board (SWRCB) and RWQCBs are responsible for establishing the water quality standards (objectives and beneficial uses) required by the CWA, and regulating discharges to ensure compliance with the water quality standards. Details regarding water quality standards in a project area are contained in the applicable RWQCB Basin Plan. In California, Regional Boards designate beneficial uses for all water body segments in their jurisdictions, and then set criteria necessary to protect these uses. Consequently, the water quality standards developed for particular water segments are based on the designated use and vary depending on such use. In addition, the SWRCB identifies waters failing to meet standards for specific pollutants, which are then state-listed in accordance with CWA Section 303(d). If a state determines that waters are impaired for one or more constituents, and the standards cannot be met through point source or non-source point controls (NPDES permits or Waste Discharge Requirements), the CWA requires the establishment of Total Maximum Daily Loads (TMDLs). TMDLs specify allowable pollutant loads from all sources (point, non-point, and natural) for a given watershed.

2.2.2 State Water Resources Control Board and Regional Water Quality Control Boards

The SWRCB adjudicates water rights, sets water pollution control policy, issues water board orders on matters of statewide application, and oversees water quality functions throughout the state by approving Basin Plans, TMDLs, and NPDES permits. RWCQBs are responsible for protecting beneficial uses of water resources within their regional jurisdiction using planning, permitting, and enforcement authorities to meet this responsibility.

2.2.3 National Pollutant Discharge Elimination System Program

2.2.3.1 Municipal Separate Storm Sewer Systems (MS4)

Section 402(p) of the CWA requires the issuance of NPDES permits for five categories of stormwater dischargers, including MS4s. The U.S. EPA defines an MS4 as "any conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels, and storm drains) owned or operated by a state, city, town, county, or other public body having jurisdiction over stormwater, that are designed or used for collecting or conveying storm water." The SWRCB has identified Caltrans as an owner/operator of an MS4 pursuant to federal regulations. Caltrans' MS4 permit covers all Caltrans rights-of-way, properties, facilities, and activities in the state. The SWRCB or the RWQCB issues NPDES permits for five years, and permit requirements remain active until a new permit has been adopted.

Caltrans' MS4 Permit (Order No .2012-0011-DWQ, NPDES NO. CAS000003), adopted in September 2012 and effective July 2013, contains three basic requirements:

- Compliance with the requirements of the Construction General Permit (CGP),
- Implementation of a year-round program in all parts of the State to effectively control stormwater and non-storm water discharges; and
- Stormwater discharges must meet water quality standards through implementation of permanent and temporary (construction) best management practices (BMPs) to the maximum extent practicable, and other measures as the SWRCB determines to be necessary to meet the water quality standards.

To comply with the permit, the Department developed the Statewide Storm Water Management Plan (SWMP) to address stormwater pollution controls related to highway planning, design, construction, and maintenance activities throughout California. The SWMP assigns responsibilities within the Department for implementing stormwater management procedures and practices as well as training, public education and participation, monitoring and research, program evaluation, and reporting activities. The SWMP describes the minimum procedures and practices the Department uses to reduce pollutants in stormwater and non-storm water discharges. It outlines procedures and responsibilities for protecting water quality, including the selection and implementation of BMPs. The proposed Project will be programmed to follow the guidelines and procedures outlined in the latest SWMP to address stormwater runoff.

This Project's Project Initiation Document phase started prior to the effective date of new Caltrans MS4 Permit, so this Project is not expected to be required to comply with the new Caltrans MS4 Permit. Therefore, the methods for evaluating the water quality impacts and discussion of avoidance, minimization and mitigation measures presented in this report are based on the current Caltrans NPDES Permit (Order No. 99-06-DWQ) and are consistent with current Caltrans District 4 practices.

2.2.3.2 Construction General Permit

The CGP (Order No. 2009-009-DWQ, as amended by 2010-0014-DWQ and 2012-0006-DWQ), adopted on November 16, 2010, became effective on February 14, 2011. The permit regulates stormwater discharges from construction sites which result in a disturbed soil area of one acre or greater, and/or are smaller sites that are part of a larger common plan of development. For all projects subject to the CGP, applicants are required to develop and implement an effective Storm Water Pollution Prevention Plan (SWPPP). In accordance with Caltrans' Standard Specifications, a Water Pollution Control Program (WPCP) is necessary for projects with disturbed soil area less than one acre.

By law, all stormwater discharges associated with construction activity where clearing, grading, and excavation results in soil disturbance of at least one acre must comply with the provisions of the CGP. Construction activity that results in soil disturbances of less than one acre is subject to this CGP if there is potential for significant water quality impairment resulting from the activity as determined by the RWQCB. Operators of regulated construction sites are required to develop SWPPPs; implement sediment, erosion, and pollution prevention control measures; and obtain coverage under the CGP.

The CGP separates projects into risk levels 1, 2, or 3. Risk levels are determined during the planning and design phases and are based on potential erosion and transport to receiving waters. Requirements apply according to the risk level determined. For example, a Risk Level 3 (highest risk) project requires compulsory stormwater runoff pH and turbidity monitoring, and pre- and post-construction aquatic biological assessments during specified seasonal windows.

2.2.3.3 Section 401 Permitting

Under Section 401 of the CWA, any project requiring a federal license or permit that may result in a discharge to a water of the United States must obtain a 401 Certification, which certifies that the project will be in compliance with State water quality standards. The most common federal permit triggering 401 Certification is a CWA Section 404 permit, issued by USACE. The 401 permit certifications are obtained from the appropriate RWQCB, dependent on the project location, or SWRCB when a project spans two or more RWQCB, and are required before USACE issues a 404 permit.

In some cases the RWQCB may have specific concerns with discharges associated with a project. As a result, the RWQCB may issue a set of requirements known as Waste Discharge Requirements (WDRs) under the State Water Code (Porter-Cologne Act) that define activities, such as the inclusion of specific features, effluent limitations, monitoring, and plan submittals that are to be implemented for protecting or benefiting water quality. WDRs can be issued to address both permanent and temporary discharges of a project.

There is no bridge widening or work planned within creek channels. A freshwater wetland exists at the downstream end of several unnamed streams that pass beneath US 101 in culverts at the southern end of the project between San Jose and Morgan Hill. Wetlands located within the project area will be preserved during construction with the use of Environmentally Sensitive Area (ESA) fencing. The proposed pavement widening for the project would be outside of any natural waterways and nearby wetlands; therefore, a 401 water quality certification is not anticipated for the project.

2.3 Regional and Local Requirements

The project is located within both the SFBRWQCB and the Central Coast RWQCB (CCRWQCB) jurisdictions as shown in Figure 3. On the local level, the creeks within the project are in the jurisdiction of the SCVWD, a local government agency that provides water resource management within the project limits.

The agencies in Santa Clara County have formed a countywide program known as the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) to assist with compliance with their permit requirements. SCVURPPP is an association of 13 cities and towns in Santa Clara Valley, Santa Clara County, and the SCVWD that share a common NPDES permit to discharge stormwater to South San Francisco Bay. Member agencies (co-permittees) include the municipalities of Cupertino, Los Altos, Los Altos Hills, Milpitas, Mountain View, Palo Alto, San Jose, Santa Clara, Sunnyvale, Campbell, Los Gatos, Monte Sereno, and Saratoga; Santa Clara County; and the SCVWD. The majority of the project is adjacent to cities and counties that are subject to a Regionwide Santa Clara County Phase I MS4 under the MRP for discharging stormwater to the San Francisco Bay and tributary creeks. The areas south of Cochrane Road are covered under the Gilroy, Morgan Hill and Santa Clara combined Phase II MS4.

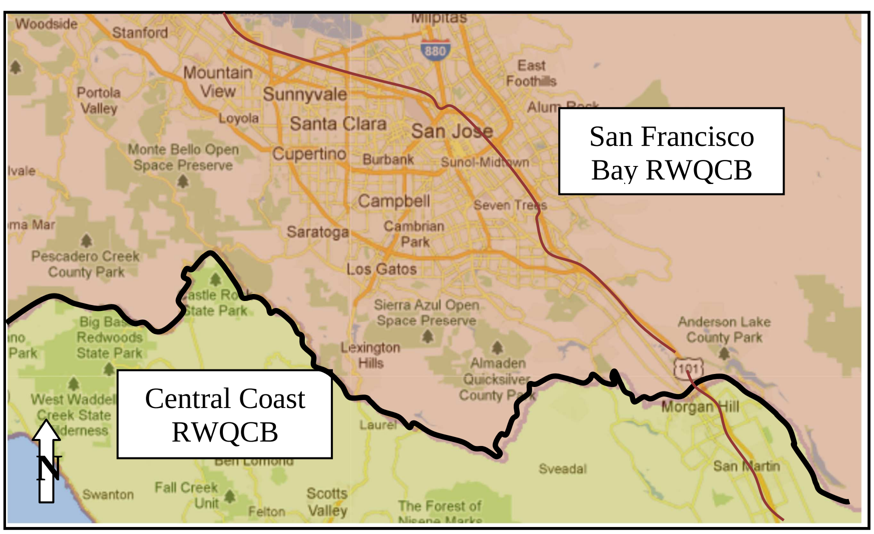


Figure 3. Boundary between San Francisco Bay and Central Coast RWQCBs

Source: State Water Resources Control Board Map

The SFBRWQCB's *Memorandum of California Department of Transportation Post-Construction Stormwater and Hydromodification Standards* (July 2008) requests Caltrans to comply with the SFBRWQCB NPDES MRP; a copy of the memorandum is included in Appendix E. The SCVURPPP has an approved hydromodification management plan (HMP). The goal of an HMP is to manage increased peak runoff flows and volumes (hydromodification) to avoid erosion of stream channels and degradation of water quality both on and off project sites. Because the project results in an increase of impervious area of 61 acres, the project will be subject to the HMP requirements for potential hydromodification effects.

The CCRWQCB is currently developing hydromodification criteria; currently these criteria are presented under the Draft Resolution No. R3-2013-0032. It is anticipated that this resolution will be approved prior to or during the design phase of this project. Therefore, hydromodification impacts will be applicable to waterways within the CCRWQCB. Hydromodification evaluation and mitigation efforts will be developed during the Plans, Specifications & Estimates (PS&E) phase.

The project may have to adhere to the General Waste Discharge Requirements (WDR) (*Order 2004-0004-DWQ*) due to the potential impacts to the waters of the State. The impacts would be detailed during the permitting phase of the project, when more site specific information becomes available. More information on the general WDR and the avoidance, minimization and mitigation measures can be obtained from the Natural Environmental Study (NES) Report (URS 2013).

The project may also be subjected to the Santa Clara Valley Habitat Conservation Plan/ Natural Community Conservation Plan. This plan's study area lies within southern Santa Clara County, which includes the project alignment. The objective of the plan is to provide measures to protect, enhance, and restore natural resources within the study area. The NES Report (URS 2013) covers the measures that would be adopted because of the plan.

3 AFFECTED ENVIRONMENT/EXISTING CONDITIONS

3.1 Study Methods and Procedures

The methods and procedures considered for the development of this report are the federal, state, and local water quality laws and regulations relevant to the project study area. These laws and regulations are the CWA, California's Porter-Cologne Water Quality Control Act, and Santa Clara County regulations.

Water quality related permits also studied and addressed in this report include the Caltrans' NPDES statewide permit, the CGP for construction and dewatering, the MRP and the upcoming CCRWQCB permit for post construction requirements. The water quality requirements of the RWQCB were also researched, such as those pertaining to water resources with beneficial uses and water quality objectives. Both the San Francisco Bay and Central Coast RWQCBs established a General Basin Plan with goals and policies that apply to Santa Clara County's water resources regarding beneficial uses and water quality objectives.

As part of this Water Quality Study, the project team reviewed existing topographic data from the United States Geological Survey, erosion and climate data from the United States Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey, and hydrology and surface streams information from the FEMA Flood Insurance Study. General information regarding channel geomorphology, existing groundwater, and biotic and aquatic groups specific to the study area were considered in order to evaluate the impacts that would result from the construction of the project and the operation and maintenance of this highway.

3.2 Study Area

The project corridor is in Santa Clara County, south of the San Francisco Bay. The alignment extends along US 101 from Dunne Avenue in Morgan Hill to the Santa Clara/San Mateo county line just north of the Oregon Expressway/Embarcadero Road interchange in Palo Alto, traversing the cities of Morgan Hill, San Jose, Santa Clara, Sunnyvale, Mountain View, and Palo Alto. The entire project corridor lies in Caltrans' right-of-way.

3.3 Population and Land Use

Per the SCVWD website, Santa Clara County is home to a diverse population of approximately 1,800,000 people. The Association of Bay Area Governments (ABAG) estimates that the county population could rise to 2,431,400 by the year 2035, almost a 35 percent increase from the current levels (2009). The project area is entirely within the existing roadway right-of-way. The adjacent land uses include commercial, light industry, agriculture and residential (URS 2011).

3.4 Topography

US 101 is on relatively flat ground along the project alignment. According to the Preliminary Geotechnical Report, the profile along the project alignment varies from depressed sections as much as 20 feet below surrounding development to embankments as high as 34 feet (URS 2013).

3.5 Soils and Geology

The PGR (URS 2013) provides detailed soil and geological information for the project. Generally the soils in the project area are characterized by soils that are rich in alluvial deposits, originating from the erosion of the Diablo Range and the Santa Cruz Mountains. The alluvial and sedimentary soil deposits consist of alternating layers of loam, clay, gravel, sand and mixtures of these elements.

The NRCS has classified 20 soil associations for Santa Clara County alone , and each soil association is composed of up to five or six different individual soils. The soils were grouped based on physiographic land divisions, a parameter that takes into account both the topography and the origin of landforms. The five major types of landforms found in the basin include alluvial fans, basin land, low terrace land, high terrace land, and uplands. Native soils within the study area are alluvial and fluvial deposits consisting predominantly of soft to very stiff lean clay, overlying interlayers and discontinuous lenses of medium dense to very dense, silty and clayey sand and gravel, and firm to very stiff, lean clay and sandy clay. Table 3 lists the various geological features presented in the PGR (URS 2013). The soils are classified as Xerorthents-Urban land-Botella and are composed of poorly drained clays and urban fill soils with poor permeability (URS 2013). The soil information showing Hydrologic Soil Groups (HSGs) is shown in Appendix D. The most dominant hydrologic soil group in the vicinity of the project is D, which includes soils with very low infiltration rates.

The county re-injects surface water back into ground within the project area. There have been subsidence problems related to groundwater obstruction in the area. The proposed project has the potential to impact municipal water supply sources, including these surface water injection areas and the Madrone Channel, due to the proposed grading and earth work activities. To prevent or avoid subsidence resulting from the project, the fill material and compaction should be coordinated with Caltrans Geotechnical Services.

3.6 Flooding Sources

With the development in the Santa Clara Valley over the years, flooding became more severe, and levees were constructed to contain flood flows along some creeks. The SCVWD assumed responsibility for flood management in all of Santa Clara County (Santa Clara Basin Watershed Management Initiative 2000). Santa Clara County is divided into five flood management zones: Llagas Creek Zone, Coyote Zone, Guadalupe Zone, West Valley Zone, and Lower Peninsula Zone. According to the SCVWD, of the 642 miles of creeks and drainage channels managed by the SCVWD, about 350 miles of channel, can convey the base flood (100-year flood) without overbank flooding. A number of flood protection projects are constructed or are being considered for the channels associated with this project, including projects on the east side tributaries of Coyote Creek (Lower Silver Creek), the middle reaches of the Guadalupe River, Permanente, Adobe, and Matadero creeks, and the Sunnyvale East and West channels (SCVWD, accessed in January 2012). A total of 27 floodplains are identified within the project limits using the FEMA Flood Insurance Rate Maps (FIRMs). More information on flooding issues and sources can be found in the Location Hydraulic Study report for this project (WRECO 2012).

Table 3. Subsurface Conditions Along 101 Express Lanes Project Alignment

Location	Subsurface Condition
Dunne Avenue to Metcalf Road	
Dunne Avenue Overcrossing	At overcrossing, dense to very dense clayey sand with gravel fill is underlain by granular layers ranging from dense to very dense clayey sand with gravel and compact to very dense sand gravel. At some locations granular layers begin at ground surface an
East Main Overcrossing	Native soil at site consisting of 2 ft of clayey silt with gravel is underlain by dense silty sand to 6 ft below ground surface with deeper compact and dense sandy gravel to 37 ft below ground surface. Below the gravel is a slightly compact clayey silt a
Cochrane Road Overcrossing	Numerous compact to very dense silty gravel, sandy gravel, and clayey gravel layers underlie a surficial sandy silt layer 2 ft thick. A 2 ft thick cemented gravel layer was encountered 36 ft below ground surface. Two interbeds were encountered in anoth
Cochrane Road to Metcalf Road	This stretch is generally underlain by localized fill overlying native soils and/or Santa Clara Formation. Embankment fill mainly consists of stiff sandy lean to fat clays containing sand and gravel, clayey sands with gravel and occasionally silty sands
Metcalf Road to Coyote Creek	
Metcalf Road to Blossom Hill Road Existing Embankments and Approach Fills	Embankments/fills generally composed of gravelly and sandy clay to clayey gravel derived from the surrounding area. Subgrade soils from imported borrow fill materials consist of poorly graded gravel.
Metcalf Road to Blossom Hill Road Native Soils and Bedrock	Existing exposed bedrock is composed of Santa Clara Formation claystone, siltstone, conglomerate, and altered tuff deposits overlain by Franciscan Complex sandstone and instructive serpentinite. Native soils are alluvial and fluvial deposits predominantl
Bernal Road Undercrossing	Upper 35 ft of soils consist of firm to very stiff clay and stiff sandy silt overlying 45 to 50 ft of medium dense to very dense clayey to silty sand with interbeds of clay and gravel. These soils are underlain by stiff to very stiff sandy clay.
Blossom Hill Road (SR 82/US 101) Separation	Subsurface soils consist of layers of loose to slightly compact silt, stiff silty clay, loose to dense fines to coarse sand, and silty sand with pebble gravel.
Bernal Road to South of Coyote Creek	Fill consisting of stiff to very stiff gravelly clay and medium dense clayey gravel is underlain by interbedded alluvial deposits of firm to very stiff, clays and silts. Lenses of loose to medium dense sand and gravel less than 3 ft thick exist in some l
Coyote Creek Bridge (No. 37-346 L)	Subsurface consists of primarily stiff sandy gravelly clay fill to a depth of 19 ft. Loose silty sand encountered between 19 and 24 ft below ground surface. Below this layer soils consist of hard clay with interbeds and lenses of medium dense sand and g
Coyote Creek Bridge (No. 37-346 R)	Upper soils consist of very stiff clay, very hard sand, and dense to very dense sand and gravel to depths from 10 ft to 20 ft below ground surface. Underlying these soils is Santa Clara Formation claystone to depths of 57 and 82 ft.
Coyote Creek to I-280/I-680 Interchange	
South of Coyote Road to near Hellyer Avenue: Station US101 340+00 to US101 320+00	Subsurface conditions consist of shallow bedrock composed of moderately to severely weathered serpentine. At Coyote Road undercrossing, bedrock is overlain by alluvial deposits from Coyote Creek or from quarrying activities.
South of Coyote Road to near Hellyer Avenue: Station US101 309+00 to US101 277+00	Sandy gravel/gravelly sands encountered to depth of 11.5 ft. This layer is underlain by interbedded alluvial deposits of firm to very stiff silts and clays to loose to medium dense sands overlying moderately to very weathered serpentine bedrock.
North of Hellyer Avenue to I-280/I-680: Station US101 277+00 to US101 240+00	Subsurface conditions consist of fill composed of stiff to very stiff gravelly clay/clayey gravel and medium dense sandy gravel and gravelly sand underlain by serpentine bedrock to a depth of 15 ft below ground surface.
North of Hellyer Avenue to I-280/I-680: Station US101 243+87 to US101 49+00	Fill composed of stiff to very stiff clay, gravelly clay, and medium dense to dense clayey gravel to a depth of 4 ft. Fill material is underlain by alluvial deposits of soft to very stiff silts and clays with low plasticity. Interbeds of loose to medium
I-280/680 Interchange to Hedding Street (Berryessa Road)	
I-280/680 to McKee Road	Below the bottom of the existing pavement structural section, subsurface conditions consist generally of native soils of stiff silty clays over 5 ft below ground surface.
San Antonio Street Overcrossing Embankments	Soils consist of moderately compacted fills of gravelly sands to sandy gravels to depths varying from 4 ft to 23 ft below ground surface. Fill is underlain by stiff to very stiff silty clays. A 10-17 ft thick layer of soft, moderately silty to sandy cla
McKee Road to South of Berryessa Road	Below the bottom of the existing pavement structural section, subsurface consists of poorly compacted fill for over 5 ft below ground surface. Fill consists of sands with various amounts of gravel in southern portion, and native soils of stiff silty clay
Julian Street/McKee Road Overcrossing Embankments	Soils consist of poorly to moderately compacted fills to 14 ft below ground surface. Fill consists of clayey to gravelly sands underlain by stiff to very stiff silty clays. In some locations, 10 ft thick layers of moderately compressible silty clays are
Coyote Creek Bridge Embankments	Subsurface conditions consist of well compacted structural fill composed of silty to clayey fine sands to maximum depths of approximately 12 to 15 ft below ground surface. The fill is underlain by stiff to hard silty clays with zones of slightly compact
Mabury Road/Taylor Street Overcrossing Embankments	Soils generally consist of poorly to moderately compacted structural fill to a maximum depth of 23 ft below ground surface. Fill consists of gravelly, fine and coarse grained sands. Fill is underlain by stiff to very stiff silty clays with sections of c
Union Pacific Railroad Underpass Eastern Embankment	Subsurface conditions consist of native soils of stiff to very stiff silty clays to approximately 9 ft below ground surface. These clays are underlain by slightly compact clayey fine sands to a depth of 14 ft, followed by stiff to very stiff silty clays.
Union Pacific Railroad Underpass Western Embankment	Soils consist of soft to very soft silty clays to depths of 18 to 21 ft below ground surface. The silty clays are soft near the surface, but are stiff to very stiff at lower elevations.
Silver Creek Bridge Embankments	Subsurface conditions consist of moderately compacted sandy fine gravel fill to approximately 6 ft below ground surface. Fill is underlain by silty clay native soils to 38 ft below ground surface, followed by clays that become stiff at greater depths.
Hedding Street (Berryessa Road) to I-880	
Hedding Street to I-880 Roadway	Subsurface conditions consist of soft to stiff to very stiff silty clay with sections of embankment fill and occasional sand interbeds.
Hedding Street/Berryessa Road Overcrossing Embankments	Subsurface consists of stiff clayey silts to silty clays to depths 10 to 13 ft below ground surface. A void exists at some locations at a depth of 13 ft, which is underlain by stiff to very stiff silty clays. A clayey sand lens is located 30 to 31 ft be
Old Oakland Road Overcrossing Embankments	Fill consists of stiff clayey silt with gravelly and sandy interbeds encountered to depths 4 to 8 ft below ground surface. Below the fill, soils consist of stiff to very stiff silty clays to a depth of 51 ft below ground surface.
North Tenth Street Overcrossing Embankments	Dense sandy to clayey gravel fill to depths 3 ft below ground surface. Stiff silty clays underlie the fill to about 23 ft below ground surface. Beneath clays, dense to very dense clayey and silty gravelly sands encountered to maximum depth of exploration
Fourth Street on-ramp to US 101/I-880 Interchange Embankments	Embankment fills vary up to 25 ft in height and generally consist of silty to sandy clay with sand and gravel. Dense and very dense sand and gravel underlie the clay layer.
North Fourth Street to West of Guadalupe River	
North Fourth Street to Guadalupe River Roadway	Subsurface conditions consist of compacted fill materials to depths 4 to 8.5 ft below ground surface. In northern and southern portion of this segment, fills consist of sands with variable amounts of clays and silts. In remaining areas, fill consists of
Proposed US 101 Embankments adjacent to Brokaw Road	Subsurface conditions consist of poorly to moderately compacted structural fill 3 to 37 ft thick. Fill is composed of gravelly, fine to coarse sands with layers of soft to stiff silty clays and is underlain by soft, moderately compressible silty clays app
SR 87/US 101 Northbound Ramp Embankments	Subsurface conditions consist of loosely to moderately compacted sandy clay fill to approximately 12 to 22 ft below ground surface. Below fill, soils consist of silty clays interbedded with layers of compact, clean to silty fine sands to depths of 24 to
Guadalupe River Bridge Embankments	Subsurface consists of poorly to moderately compacted clayey fine to coarse sand fill to approximately 4 to 6.5 ft below ground surface. On eastern side, fill is underlain by alternating layers of soft, compressible silty clays and compact clean to silty
Eastern and Western Embankments along US 101 R/W	Subsurface conditions consist generally of stiff to very stiff silty clays to approximately 34 to 39 ft below ground surface.

Table 3 is continued on the next page.

Table 3. Subsurface Conditions Along 101 Express Lanes Project Alignment (continued)

Location	Subsurface Condition
West of Guadalupe River to SR 237	
Lafayette Street Overcrossing	Subsurface material consists of stiff to very stiff silty clay, sandy silt and clayey silt to 65 ft below ground surface, underlain by compact sand and gravel. In some locations, soils consists of alternating layers of stiff to soft clay and silt, and sl
San Tomas Aquino Creek Bridge	Soils consist predominantly of stiff to very stiff clays and silts, with occasional soft or very soft clays and silts to depths approximately 45 ft below ground surface. Granular interbeds, ranging in thickness from 1 to 15 ft, consist of compact to dens
Bowers Avenue Overcrossing	Subsurface conditions consist primarily of stiff to very stiff silts and clays; in some sections a soft layer of clay composes the upper 6 ft of soil. Granular interbeds, ranging in thickness from 2 to 11 ft, include compact to dense sand and dense to ve
Lawrence Expressway Overcrossing	Subsurface conditions provided with two different investigations: January 1995 and June 1956. The 1995 investigation provided that soils consist of 4 to 20 ft of clayey silt, silty clay and sandy gravel underlain by native layers of stiff to hard silty cl
Fair Oaks Avenue Overcrossing	Subsurface conditions consist of soft silt fill to a depth of 6 ft below ground surface, underlain by fine grained layers of soft to very soft silt and clay. Granular interbeds 5 to 6 ft thick range from slightly compact to very dense sand and gravel.
SR 237 to SR 85	
Moffett Field Depressed Track to Moffett Field Station	Subsurface conditions generally consist of an upper stiff clay layer, varying in thickness from 3 to 10 ft. The upper layer is generally underlain by silty clay varying in consistency from soft to medium, and overlies a 5 to 10 ft thick medium dense to d
Moffett Field Overhead	Eastern approach embankment consists of very stiff to hard cohesive fill materials of silty and sandy clays with traces of gravel. Native soils described as alluvial soils with alternating layers of clay, silt, sand, and gravel underlie the fill material
SR 85 Interchange to Embarcadero Road	
Northbound US 101 off-ramp/US 101 Separation	Site is underlain by alluvial material, which consists of layers of clay and sand. At abutment location, pavement is above a layer of stiff to very stiff clay, which is underlain by layers of clay, sandy clay, and silty sand to maximum explored depths of
Stevens Creek Bridge	A 1 ft thick asphalt concrete section is underlain by medium dense clayey sand to about 5 ft below ground surface. Sand layer is above a layer of very stiff to hard fat clay to a depth of about 13 ft, below which are interbedded layers of clay, silty san
SR 85-US101/southbound US 101 HOV Connector Separation & northbound SR 85-US 101/US 101 Connector Separation	Subsurface soils are predominantly alluvium. Superficial layer consists of 2 t o3 ft of stiff sandy clay. A 10 to 15 ft thick stiff to very stiff clay layer encountered throughout, underlain by sand and clay layers of varying thickness and gradations.
Northbound SR 85 off-ramp/US 101 Separation	Bridge site is underlain by alluvial deposits consisting of interbedded layers of clays, silts and sands with small amounts of gravel to depths ranging from 65.5 to 98.5 ft below ground surface.
Southbound US 101 on-ramp/S101-S85 Separation	Bridge site is underlain by alluvial deposits consisting of interbedded layers of clays, silts and sands with small amounts of gravel.
North Shoreline Boulevard to Embarcadero Road	Subsurface conditions consist generally of alluvium composed of interbedded lean and fat clay, clayey, silty sand, and well-graded sand with silt. Clay alluvium is generally soft to very stiff and sand interbeds are medium dense to dense. From the southe

Source: URS 2011

3.7 Erosion Potential

The erosion potential is low for the Santa Clara Valley floor soils (Schaaf and Wheeler 2009). Soils in the foothills have a greater potential for erosion. Most of project is highly urbanized with well disturbed and highly variable soils. Per the Preliminary Geotechnical Report (URS 2011), natural slopes along the project alignment are relatively flat. The report states that the majority of the southern portion of the roadway between Dunne Avenue and Metcalf Road is in well vegetated cuts or fills. The median is typically paved in this segment. Between Alum Rock Avenue and De La Cruz Boulevard, a majority of the roadway is in deep cuts retained by concrete retaining walls. For a majority of the project area, the erosion potential is low; however, there is a large cut through a hillside near Hellyer Avenue, which has high potential for changes in erosion rates.

3.8 Climate and Precipitation

The climate in this area is characterized as a Mediterranean semi-arid climate, which is temperate year-round, with warm and dry weather lasting from late spring through early fall. The area has mild winters, mild summers, small daily and seasonal temperature ranges and high relative humidity. Based on statistical data at the San Jose weather station located approximately in the middle of the project alignment, the mean annual temperature is 61.3°F. The extreme temperatures range from an average low temperature of 41°F in December and January to an average high temperature of 84°F in July and August. Average precipitation in San Jose is 15.08 inches per year, primarily confined to the months of October through April. Annual precipitation ranges from less than 16 inches in the valley to more than 28 inches in the upland areas.

3.9 Existing Creek Crossings and Watershed

3.9.1 Regional Hydrology

The project lies in the Santa Clara sub-basin, bordered by Diablo Range on the west and the Santa Cruz Mountains on the east. It extends from the northern border of Santa Clara County to the groundwater divide near the town of Morgan Hill. The hydrology along US 101 is controlled by existing creeks and drainages, with extensive runoff contribution from urban and residential development, roadways, and parking areas. US 101 crosses several large watersheds, and most of the creeks and drainages it crosses ultimately flow into the South San Francisco Bay. The main tributaries include Coyote Creek, Guadalupe River, and Stevens Creek.

3.9.2 Local Hydrology

A total of 13 receiving water bodies have been identified for the project. From south to north, these waterways are: Llagas Creek, Coyote Creek, Upper Silver Creek, Lower Silver Creek, Guadalupe River, San Tomas Aquino Creek, Calabazas Creek, Sunnyvale East Channel, Sunnyvale West Channel, Stevens Creek, Permanente Creek, Adobe Creek and Matadero Creek. The southernmost portion of the project, from Dunne Avenue to Cochrane Avenue, is within the CCRWQCB. Flow from this area drains into Madrone Channel, which flows south toward Llagas Creek and eventually into Monterey Bay. Madrone Channel and Llagas Creek do not cross the US 101 alignment within the project limits. The remaining 12 receiving water bodies cross US 101 within the project limits, with Coyote Creek crossing the roadway at four separate locations. All the waterways that cross within the project limits ultimately discharge to the San Francisco Bay. The sizes and types of these crossings are listed in Table 4.

The US 101 alignment travels through the following watersheds: Uvas/Llagas Creek, Coyote Creek, Guadalupe River, San Tomas Aquino Creek, Calabazas Creek, Sunnyvale East Channel, Sunnyvale West Channel, Stevens Creek, Permanente Creek, Adobe Creek, and Matadero Creek, as shown in Figure 4. The following sections discuss the watersheds and the creeks associated with the project.

Madrone Channel located near Morgan Hill and parallels US 101 from Half Road to Llagas Creek. The channel provides necessary flows for the SCVWD groundwater recharge facilities. The source of flow within this channel is Anderson Reservoir via the Coyote-Madrone Pipeline.

Table 4. Drainage Facilities at Major Crossings

No.	Crossing	Layout Line	Station	Post mile	Drainage Facility
1	Coyote Creek	"A"	232+50	R019.21	410 ft long x 72 ft wide multiple prestressed box beam or girder bridge
2	Coyote Creek	"A"	611+00	R026.47 R026.60	474 ft long x 95 ft wide multiple prestressed box beam or girder bridge
3	Coyote Creek	"A"	811+50	29.83	403 ft long x 72 ft wide steel multi-beam or girder
4	Upper Silver Creek	"A"	881+00	N/A	Unknown
5	Lower Silver Creek	"A"	1155+00	36.37	63 ft long by 159 ft wide-3 span concrete slab bridge
6	Coyote Creek	"A"	1173+00	36.69	200 ft long x 147 ft wide-6 span concrete tee beam
7	Guadalupe River	"A"	1357+50	40.19	50 ft x 176 ft prestressed box beam or girders; 50 ft x 142 ft concrete tee beam
8	San Tomas Aquino Creek	"A"	1465+60	42.45	92 ft long x 166 ft wide concrete slab bridge
9	Calabazas Creek	"A"	1522+00	43.32	40 ft long x 325 ft wide 3 span reinforced concrete culvert
10	Sunnyvale East Channel	"A"	1594+10	44.69	12 ft x 8 ft reinforced concrete box culvert
11	Sunnyvale West Channel	"A"	1656+70	45.87	10 ft long x 7 ft wide box culvert
12	Stevens Creek	"A"	1771+30	48.04	50 ft long by 20 ft wide dual span concrete bridge
13	Permanente Creek	"A"	1832+00	49.19	12 ft x 12 ft reinforced concrete box culvert
14	Adobe Creek	"A"	1909+70	50.66	65 ft long by 133 ft wide single span concrete bridge
15	Matadero Creek	"A"	1947+50	51.37	81 ft long by 133 ft wide single span concrete bridge

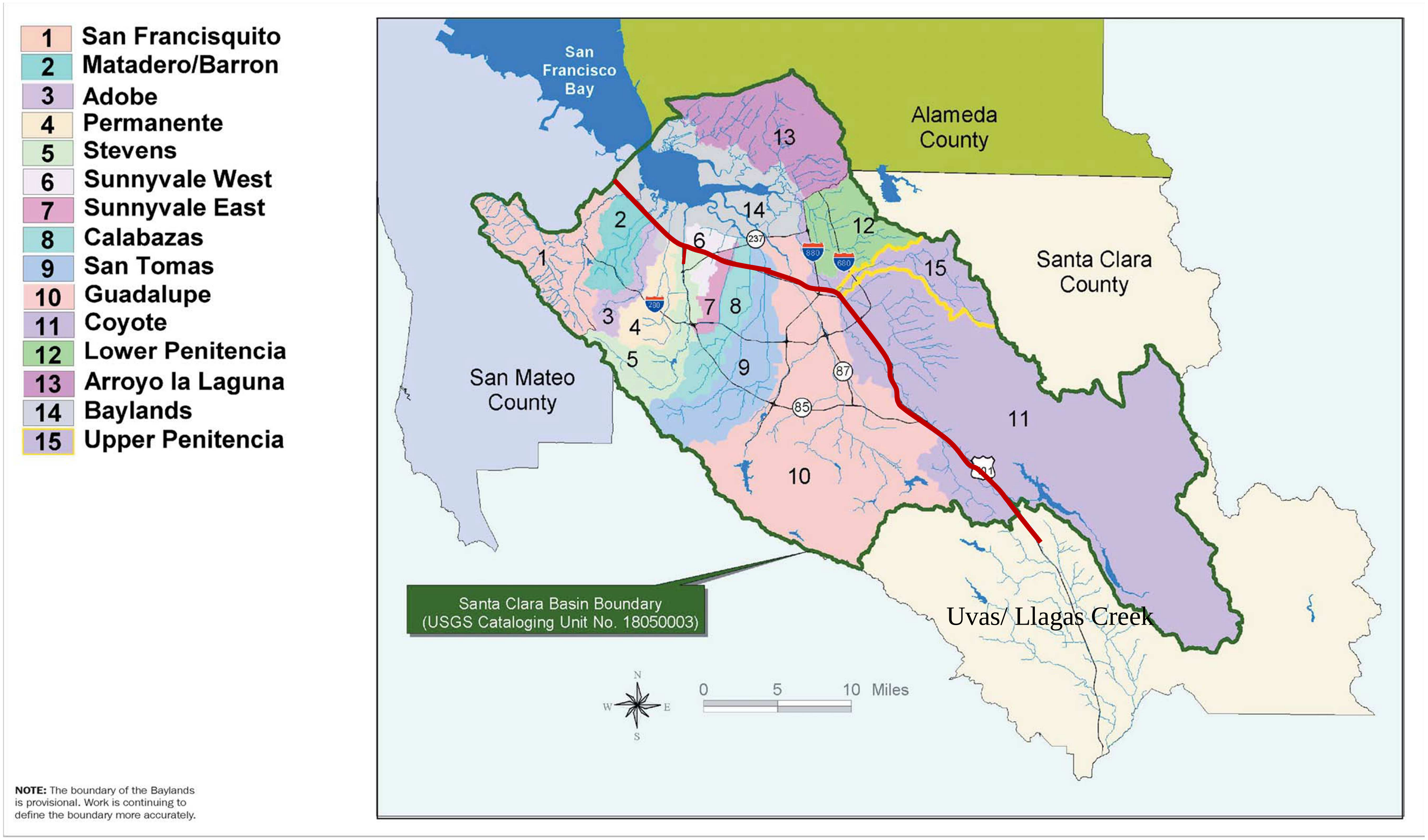


Figure 4. Watershed Map for the Major Creeks Crossing the Project Alignment

Source: www.scvurppp-w2k.com accessed January 2012

3.9.3 Uvas/Llagas Creek Watershed

The Uvas/Llagas watershed drains approximately 104 square miles of area to the Pajaro River and ultimately to the Monterey Bay. There are no creek crossings within the project limits that belong to the Uvas/Llagas watershed. However, a small portion of the highway runoff drains to the Madrone Channel, which runs parallel to the US 101 alignment south of the project limits. The Madrone Channel is a manmade ditch in the Llagas Creek watershed, which flows southwest and ultimately discharges into Monterey Bay. The majority of this watershed is composed of agricultural and rural residential uses.

3.9.4 Coyote Creek Watershed

The Coyote Creek watershed is the largest in the Santa Clara Basin and drains approximately 320 square miles into the South San Francisco Bay. The southernmost portion of the project in Santa Clara County flows into this watershed. Coyote Creek originates in the mountains northeast of the City of Morgan Hill and flows northwest through unincorporated areas between Morgan Hill and San Jose and then through urbanized areas of San Jose and Milpitas before it discharges into the Bay. Upper Silver Creek and Lower Silver Creek cross US 101 a short distance upstream of their confluence with Coyote Creek. Coyote Creek (main channel) crosses US 101 four times within the project area.

Coyote Creek at US 101 (Station US 101-232+50): Coyote Creek crosses US 101 approximately 0.6 miles north of the Burnett Avenue overcrossing. The creek crosses the highway through a 200 foot long by 147 foot wide six-span concrete tee beam bridge structure.

Coyote Creek at US 101 (Station US 101-617+00): Coyote Creek crosses US 101 and the northbound on-ramp from US 101 to SR 85 within the southern US 101/SR 85 interchange. Coyote Creek is conveyed under US 101 via four separate bridges ranging from 474 feet to 773 feet in length and from 47 to 95 feet in width.

Coyote Creek at US 101 (Station US 101-811+50): Coyote Creek crosses US 101 near Hellyer Avenue. Coyote Creek is conveyed under US 101 via a 403 foot long by 72 foot wide steel beam bridge.

Upper Silver Creek at US 101 (Station US 101-881+00): Upper Silver Creek crosses US 101 approximately 0.2 miles north of the Yerba Buena Boulevard crossing. The open lined channel runs parallel to the US 101 northbound ramp between the Yerba Buena Boulevard and US 101 crossings, transitions into a single 10 foot by 8 foot (approximate) reinforced concrete box (RCB) culvert under US 101 and then daylights downstream of the crossing near Kinsule Court. The channel downstream of the US 101 crossing is a concrete trapezoidal ditch and flows in the northwest direction parallel to the mainline highway for about 1,100 feet. It turns southwest and drains into Coyote Creek approximately 0.62 miles from the US 101 crossing.

Lower Silver Creek at US 101 (Station US 101-1155+00): Lower Silver Creek crosses US 101 approximately 0.2 miles northwest of the McKee Road overcrossing. It crosses the highway through a 63 foot long by 156 foot wide, three-span bridge. The channel drains into Coyote Creek approximately 0.4 miles downstream of this bridge crossing.

Coyote Creek at US 101 (Station US 101-1173+00): Coyote Creek crosses US 101 between the Taylor Street overcrossing to the northwest and the East San Jose underpass to the southwest in the City of San Jose. The creek crosses US 101 through a 410 foot long by 72 foot wide, multiple prestressed box beam or girder bridge.

3.9.5 Guadalupe River Watershed

The Guadalupe River watershed drains approximately 171 square miles into the San Francisco Bay. The Guadalupe River begins at the confluence of Alamitos and Guadalupe creeks and flows 19 miles through heavily urbanized portions of San Jose, ultimately discharging into South San Francisco Bay through Alviso Slough. The Guadalupe River watershed is the second largest watershed in the Santa Clara Basin.

Guadalupe River (Station US 101-1357+00): Guadalupe River crosses US 101 just west of the SR 87/US 101 separation in the City of Santa Clara. The water body crosses the US 101 alignment through a 142 foot long by 174 foot wide four-span bridge. It then also crosses the US 101 northbound on-ramp through a 176 foot long by 50 foot wide dual-span bridge.

3.9.6 San Tomas Aquino Creek Watershed

The San Tomas Aquino Creek watershed drains approximately 45 square miles into the San Francisco Bay. San Tomas Aquino Creek flows northerly from the forested foothills of the Santa Cruz Mountains through the cities of Campbell and Santa Clara into Guadalupe Slough, and ultimately into South San Francisco Bay. Most of the watershed is developed with high-density residential areas and additional areas developed for commercial and industrial uses.

San Tomas Aquino Creek (Station US 101-1465+60): San Tomas Aquino Creek crosses US 101 approximately 0.3 miles west of Montague Expressway in the City of Santa Clara, through a 92 foot long by 166 foot wide three-span bridge.

3.9.7 Calabazas Creek Watershed

The Calabazas Creek watershed drains approximately 20 square miles into the San Francisco Bay. The total drainage area is 22.7 square miles, 2.2 square miles of which are rural. The Calabazas Creek watershed is highly urbanized, predominantly with high-density residential neighborhoods. Calabazas Creek originates 1,920 feet above mean sea level in the Santa Cruz Mountains and flows north through the cities of Sunnyvale and Santa Clara. As the creek nears I-280, it receives some of the diverted flow from Junipero Serra Channel; the remaining flow from Junipero Serra Channel is diverted into Sunnyvale East Channel. Calabazas Creek joins San Tomas Aquino Creek at sea level near San Francisco Bay. There are no flood control facility reservoirs on Calabazas Creek.

Calabazas Creek (Station US 101-1522+00): Calabazas Creek crosses the project alignment approximately 0.5 miles east of the Lawrence Expressway overcrossing. At US 101, Calabazas Creek is conveyed under a three-span concrete bridge, which is a 40 foot long by 235 foot wide three-span concrete bridge.

3.9.8 Sunnyvale East Channel Watershed

The Sunnyvale East Channel watershed covers approximately 7.1 square miles extending from central Cupertino northeast toward the City of Sunnyvale. The channel is 6 miles long and extends from I-280 in the south to Guadalupe Slough in the north and ultimately drains to South San Francisco Bay. The Sunnyvale East Channel watershed is almost entirely urbanized except for some open space in the Sunnyvale Baylands along the San Francisco Bay shoreline and some small city-owned parks in Sunnyvale and Cupertino. The urbanized area predominantly consists of approximately 59% residential development and 23% commercial and industrial areas.

Sunnyvale East Channel (Station US 101-1594+10): Sunnyvale East Channel crosses US 101 approximately 750 feet east of the Fair Oaks Avenue overcrossing in the City of Sunnyvale. It crosses US 101 through an underground culvert system. The culvert system continues underground on the downstream side of US 101 and daylights approximately 700 feet downstream of the crossing.

3.9.9 Sunnyvale West Channel Watershed

The Sunnyvale West Channel watershed drains approximately 7.5 square miles into the San Francisco Bay. The channel is approximately 3 miles long and originates in the urbanized sections of Sunnyvale and drains to Guadalupe Slough before draining into the Bay. The Sunnyvale West Channel watershed is almost completely urbanized except for some open space in the Sunnyvale Baylands along the San Francisco Bay shoreline and a few small city-owned parks in Sunnyvale. The urbanized area consists of approximately 31% public/institutional development, 25% industrial area, and 23% residential areas.

Sunnyvale West Channel (Station US 101-1656+70): Sunnyvale West Channel crosses US 101 between the SR 237 junction and the Mathilda Avenue overcrossing in the City of Sunnyvale. It crosses US 101 through an approximately 10 foot by 8 foot box culvert.

3.9.10 Stevens Creek Watershed

The northernmost section of the project lies within the Stevens Creek watershed. The watershed drains approximately 29 square miles into San Francisco Bay. Approximately 34% of the watershed consists of urbanized portions of the cities of Cupertino, Sunnyvale and Mountain View. In addition to the urbanized area, approximately 2% of the area is used as non-urbanized development, such as agriculture, golf courses and mines. The remaining 64% is open space in the Santa Cruz Mountains (Tetra Tech 2006).
Stevens Creek (Station US 101-1771+30): Stevens Creek crosses US 101 just east of the US 101/SR 85 interchange under a 50 foot long, 201 foot wide dual-span concrete bridge in a concrete-lined trapezoidal channel.

3.9.11 Permanente Creek Watershed

The total area for the Permanente Creek watershed is approximately 17.5 square miles. At the US 101 crossing, the watershed area is approximately 15.8 square miles. The cities of Mountain View and Los Altos are fully developed and cover approximately 55% of the watershed area. In addition to the urbanized area, approximately 8% of the area is used as non-urbanized development, such as a golf course and a mine. The remaining 37% is open space, predominantly in the ridge foothills. Permanente Creek crosses US 101 between the North Rengstorff Avenue interchange (approximately 2,200 feet northwest of the creek crossing) and the Shoreline Boulevard interchange (approximately 3,100 feet southeast of the creek crossing).

Permanente Creek (Station US 101-1832+00): Permanente Creek crosses US 101 in a 216 foot long single 12 foot by 12 foot (span x rise) RCB culvert. The creek originates in the Santa Cruz Mountains, travels 19 miles north to the San Francisco Bay, and passes through the unincorporated areas of Santa Clara County as well as the City of Cupertino, Town of Los Altos Hills, City of Los Altos, and City of Mountain View. At the downstream end of the project site, Permanente Creek passes through a twin RCB culvert at Charleston Road and a bridge at Amphitheatre Parkway to discharge to Mountain View Slough; the creek eventually outfalls to the San Francisco Bay. The channel upstream of the US 101 cross culvert is conveyed in a 12 foot by 9 foot (width x depth) concrete lined channel. There is a 3 foot drop immediately upstream of the US 101 cross culvert.

3.9.12 Adobe Creek Watershed

The watershed area of Adobe Creek is approximately 13.5 square miles: 10.4 square miles from Adobe Creek and 3.1 square miles from Barron Creek (FEMA 1999a). Adobe Creek originates in the highlands of the unincorporated areas of Santa Clara County and Palo Alto Hills. Land use within the City of Palo Alto and City of Los Altos is fully urbanized. Open space is limited to the area in the foothills of the upstream watershed. Approximately 70% of the watershed area is urbanized, and 30% is open space. Currently, the area surrounding the project site is 40 to 60% impervious; future residential or commercial developments could increase the impervious area (Tetra Tech 2006).

Adobe Creek (Station US 101-1909+70): Adobe Creek crosses US 101 between the Matadero Creek crossing (approximately 3,700 feet northwest of the creek crossing) and the San Antonio Road interchange (approximately 1,800 feet southeast of the creek crossing). Adobe Creek has its confluence with Barron Creek at the upstream face of the US 101 highway crossing.

3.9.13 Matadero Creek Watershed

The Matadero Creek watershed is approximately 14 square miles. Eleven square miles are within mountainous areas, and three square miles are in gently sloping terrain. Within the City of Palo Alto, the watershed is almost fully urbanized. Overall, 76% of the watershed area is urbanized for residential, commercial, industrial, and institutional use. There is open space in the foothills, which covers approximately 24 percent of the watershed area. About 40 to 60% of the fully urbanized area near the project site is impervious. The impervious area is expected to increase in the future from probable developments (Tetra Tech 2006).

Matadero Creek (Station US 101-1947+50): Matadero Creek crosses US 101 approximately 3,200 feet southeast of the Oregon Expressway interchange. The creek originates near the Town of Los Altos Hills, flowing northeast through the unincorporated areas of Santa Clara County and the City of Palo Alto.

3.10 Water Quality Objectives

The 1972 Amendments to the federal Water Pollution Control Act declared that elimination of discharge of pollutants into navigable waters (SWRCB 1972) is a national goal. The establishment of a base or reference point is a prerequisite to water quality control. The RWQCB needs to utilize current technical guidelines, available historical data, and enforcement feasibility when formulating water quality objectives.

The general water quality objectives established for all San Francisco Bay hydrologic basins are color, tastes and odor, floating material, suspended material, sulfide, settleable material, oil and grease, bacteria, biostimulatory substances, sediment, turbidity, pH, population and community ecology, dissolved oxygen, temperature, toxicity, pesticides,
un-ionized ammonia, salinity, chemical constituents, organic substances, and radioactive substances.

The receiving water bodies for the project listed on the 2010 Integrated Report (Clean Water Act Section 303[d] List / 305[b] Report) are Calabazas Creek, Coyote Creek, Guadalupe River, Matadero Creek, Permanente Creek, San Tomas Aquino Creek, Silver Creek (both upper and lower) and Stevens Creek. The ultimate receiving water body, South San Francisco Bay, is also on the list. Llagas Creek, which does not cross the project alignment, is listed as well. Table 5 includes the receiving water bodies listed in the 303(d) list; the pollutant and source; and the proposed or approved total maximum daily load (TMDL) date for each of these water bodies. See Appendix A for more information regarding the general objectives for surface waters.

Table 5. Receiving Water Bodies on the 2010 303(d) List

Water Body	RWQCB	Pollutant	Potential Sources	TMDL Date
Llagas Creek (below Chesbro Reservoir)	Central Coast	Chloride	Nonpoint Source Point Source	2021
		Chlorpyrifos	Agriculture Source Unknown	2021
		Electrical Conductivity	Source Unknown	2021
		Escherichia coli (E. coli)	Source Unknown	2011
		Fecal Coliform	Natural Sources Nonpoint Source Pasture Grazing-Riparian and/or Upland	2011
		Low Dissolved Oxygen	Agricultural Return Flows Habitat Modification Irrigated Crop Production Municipal Point Sources	2021
		Nutrients	Agricultural Return Flows Agriculture Agriculture-irrigation tailwater Agriculture-storm runoff Habitat Modification Irrigated Corp Production Municipal Point Sources Nonpoint Source Pasture Grazing-Riparian and/or Upland Unknown Point Source Urban Runoff/Storm Sewers	2006 (Approved)
		Sediment/Siltation	Agriculture Habitat Modification Hydromodification	2007 (Approved)
		Sodium	Nonpoint Source Source Unknown	2021
		Total Dissolved Solids	Nonpoint Source Point Source	2021
		Turbidity	Source Unknown	2021
Coyote Creek (Santa Clara County)	San Francisco	Diazinon	Urban Runoff/Storm Sewers	2007 (Approved)
		Trash	Illegal Dumping Urban Runoff/Storm Sewers	2021
Silver Creek		Trash	Illegal Dumping Urban Runoff/Storm Sewers	2021
Guadalupe River		Diazinon	Urban Runoff/Storm Sewers	2007 (Approved)
		Mercury	Mine Tailings	2008
		Trash	Illegal Dumping Urban Runoff/Storm Sewers	2021
San Tomas Aquino Creek (shown as Saratoga Creek upstream tributary)		Diazinon	Urban Runoff/Storm Sewers	2007 (Approved)
		Trash	Illegal Dumping Urban Runoff/Storm Sewers	2021
Calabazas Creek		Diazinon	Urban Runoff/Storm Sewers	2007 (Approved)
Stevens Creek		Diazinon	Urban Runoff/Storm Sewers	2007 (Approved)
		Temperature, water	Channelization Habitat Modification Removal of Riparian Vegetation	2021
		Toxicity	Source Unknown	2019
		Trash	Illegal Dumping Urban Runoff/Storm Sewers	2021
Permanente Creek		Diazinon	Urban Runoff/Storm Sewers	2007 (Approved)
		Selenium, Total	Source Unknown	2021
		Toxicity	Source Unknown	2021
		Trash	Illegal Dumping Urban Runoff/Storm Sewers	2021
Matadero Creek		Diazinon	Urban Runoff/Storm Sewers	2007 (Approved)
		Trash	Illegal Dumping Urban Runoff/Storm Sewers	2021
San Francisco Bay, South		Chlordane	Nonpoint Source	2013
		DDT (dichlorodiphenyltrichorethane)	Nonpoint Source	2013
		Dieldrin	Nonpoint Source	2013
		Dioxin compounds(including 2, 3, 7,8 – TCDD)	Atmospheric Deposition	2019
		Furan Compounds	Atmospheric deposition	2019
		Invasive Species	Ballast Water	2019
		Mercury	Atmospheric Deposition Industrial Point Source Municipal Point Source Natural Source Nonpoint Source Resource Extraction	2008
		PCBs (Polychlorinated biphenyls)	Unknown Nonpoint Source	2008
		PCBs (Polychlorinated biphenyls) (dioxin-like)	Unknown Nonpoint Source	2008
		Selenium	Domestic Use of Ground Water	2019

Source: 2010 California 303 (d) list

3.11 Beneficial Uses of Receiving Water Bodies

Beneficial uses are critical to water quality management in California. According to state law, the beneficial uses of California's waters that may be protected against quality degradation include, but are 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" (Water Code Section 13050). Beneficial uses for surface and ground waters are divided into the 20 standard categories with definitions listed in 0. Protection and enhancement of existing and potential beneficial uses are the primary goals of water quality planning. The receiving water bodies in the project with designated beneficial uses are listed in Table 6.

Table 6. Beneficial Uses of Water in the Project Area (Santa Clara Basin)

Water Body	Beneficial Uses															
	AGR	**FRSH**	**GWR**	**IND**	**COMM**	**SHELL**	**COLD**	**EST**	**MIGR**	**RARE**	**SPWN**	**WARM**	**WILD**	**REC-1**	**REC-2**	**NAV**
Coyote Creek			**E**				**E**		**E**	**E**	**E**	**E**	**E**	**P**	**E**	
Calabazas Creek	**E**	**E**	**E**				**E**					**E**	**E**	**E**	**E**	
Stevens Creek		**E**					**E**		**E**		**P**	**E**	**E**	**E**	**E**	
Permanente Creek							**E**				**E**		**E**	**E**	**E**	
Matadero Creek							**E**		**E**		**E**	**E**	**E**	**E**	**E**	
San Francisco Bay, South				**E**	**E**	**E**		**E**	**E**	**E**	**P**		**E**	**E**	**E**	**E**

Source: San Francisco Bay RWQCB Basin Plan (accessed on January 17, 2011)

Notes:
AGR—Agricultural Supply
BIOL—Preservation of Biological Habitats of Special Significance
COLD—Cold Freshwater Habitat
COMM—Commercial and Sport Fishing
EST—Estuarine Habitat
FRSH—Freshwater Replenishment
GWR—Ground water Recharge
IND—Industrial Service Supply
MIGR—Migration of Aquatic Organisms
MUN—Municipal and Domestic Supply
NAV—Navigation
RARE—Rare, Threatened, or Endangered Species
REC-1—Water Contact Recreation
REC-2—Non-contact Water Recreation
SHELL—Shellfish Harvesting
SPWN—Spawning, Reproduction, and/or Early Development
WARM—Warm Freshwater Habitat
WILD—Wildlife Habitat
E—Existing Beneficial Uses
P—Potential Beneficial Uses
L— Listed Beneficial Uses

3.12 Hydromodification Susceptibility

The project will add approximately 61 acres of impervious area. An increase in impervious area will result in more stormwater runoff due to a decrease in infiltration by previously pervious areas. The additional runoff will cause a faster and larger peak in the project's hydrograph, which could potentially increase downstream erosion to unlined channels.

In general, the susceptibility of the receiving waterways and outfalls will be dependent on several factors: channel lining, channel slope, watershed size, watershed composition, and proximity to a tidal water body. BMPs will be implemented wherever feasible to minimize impacts from additional runoff from widened roadways and maintain existing flow patterns of watercourses as well as surrounding soil composition.

The project alignment follows the western margin of the Santa Clara Valley within the San Francisco Bay block, in the central portion of the Coast Range's geomorphic province of California (URS 2011). Fluvial sand, gravel and clay deposits are present along the banks and engineered channel of Coyote Creek and along several other drainages crossed by the alignment including the Guadalupe River and Stevens Creek.

Based on the HMP map (see Figure 5), most of the channel crossings lie in areas that are not susceptible to hydromodification due to watershed composition or because the area downstream of the project lies in the tidally influenced areas as highlighted in the HMP Map for Santa Clara County. The remaining channels are considered susceptible and will be analyzed in detail during the design phase of the project. Section 3.11 presents the channels' conditions and their susceptibility to hydromodification impacts based on WRECO's field assessment. See Table 5 for a summary of hydromodification susceptibility.

The proposed measures to address hydromodification impacts can include structural measures, such as underground detention, and non-structural measures, through the modification of proposed treatment BMPs to accommodate flow and volume control. The proposed measures must be designed to show that runoff discharge rates and durations match the pre-project discharge rates and durations, from 10% of the pre-project 2-year peak flows up through the pre-project 10-year peak flows. The post-project discharge rates should not exceed the pre-project rates by more than 10% for more than 10% of the record duration. For the outfalls susceptible to hydromodification impacts, an increase in impervious surface area can be evaluated using computer modeling, such as the Bay Area Hydrology Model (BAHM), and by evaluating a watershed for cumulative effects from impervious surface and pollutant runoff. This computer modeling is not possible during this phase of the project. However, as survey information becomes available during the design phase, this task will be performed.

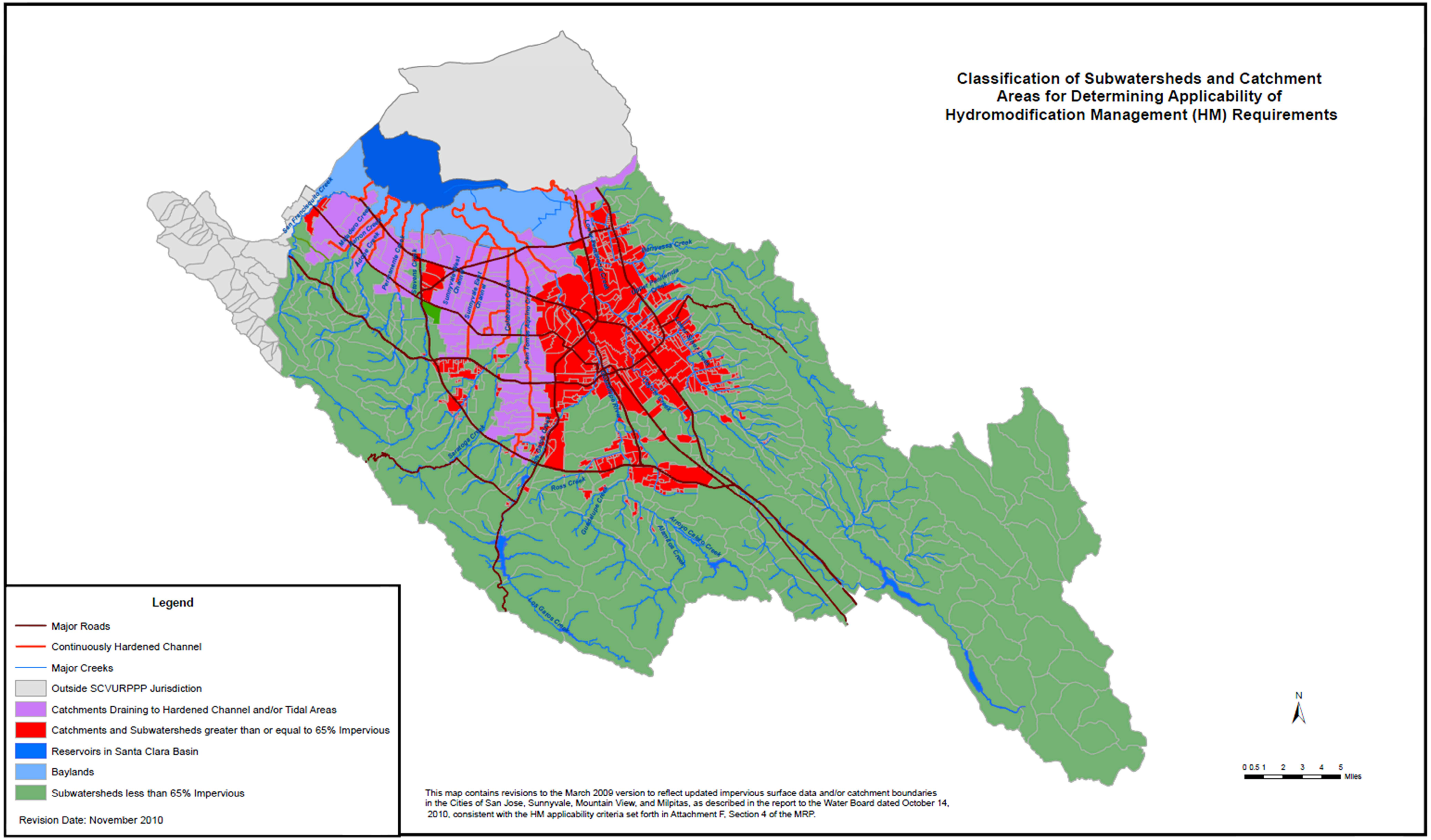


Figure 5. Santa Clara County HMP Map

Source: SCVURPPP

Table 7. Hydromodification Susceptibility Evaluation for the Project

Creek Crossing/ Outfall	Alignment	Station at Crossing	Exempt from Hydromodification Requirements	Exemption Criteria
Madrone Channel	US 101	-	Yes	Catchments Draining to Hardened Channel and/or Tidal Areas
Coyote Creek	US 101	232+50	No	Susceptible to Hydromodification
Coyote Creek	US 101	611+00	No	Susceptible to Hydromodification
Coyote Creek	US 101	811+50	No	Susceptible to Hydromodification
Upper Silver Creek	US 101	881+00	Yes	The Channel is Lined/ hardened upstream and downstream of the project site
Silver Creek	US 101	1155+00	Yes	Catchments and Subwatersheds greater than or equal to 65% Impervious
Coyote Creek	US 101	1173+00	Yes	Catchments and Subwatersheds greater than or equal to 65% Impervious
Guadalupe River	US 101	1357+50	Yes	Catchments and Subwatersheds greater than or equal to 65% Impervious
San Tomas Aquino Creek	US 101	1465+60	Yes	Catchments Draining to Hardened Channel and/or Tidal Areas
Calabazas Creek	US 101	1522+00	Yes	Catchments Draining to Hardened Channel and/or Tidal Areas
Sunnyvale East Channel	US 101	1594+10	Yes	Catchments Draining to Hardened Channel and/or Tidal Areas
Sunnyvale West Channel	US 101	1656+70	Yes	Catchments Draining to Hardened Channel and/or Tidal Areas
Stevens Creek	US 101	1771+30	Yes	Catchments Draining to Hardened Channel and/or Tidal Areas
Permanente Creek	US 101	1832+00	Yes	Catchments Draining to Hardened Channel and/or Tidal Areas
81" Culvert		1875+50	Yes	Catchments Draining to Hardened Channel and/or Tidal Areas
Adobe Creek	US 101	1909+70	Yes	Catchments Draining to Hardened Channel and/or Tidal Areas
Matadero Creek	US 101	1947+50	Yes	Catchments Draining to Hardened Channel and/or Tidal Areas

3.13 Channel Crossing Characteristics

The following section explores the characteristics of the channel crossings along the project corridor. Specifically, characteristics that define the stability and susceptibility of the channel to hydromodification are presented, based on information collected through research and WRECO's site visits. Per the HMP Map for the Santa Clara County (Figure 5), the northern portion of the project lies in the area which is exempt from any hydromodification mitigation requirements. The main exemption criteria applicable to this project are: the channels downstream of the crossing are tidal, or the tributary watershed is composed of greater than or equal to 65% impervious area. Table 7 lists the crossings and whether or not they are susceptible to hydromodification. The southern portion of the project would be considered susceptible to the hydromodification mitigation requirements. The following sections describe the general characteristics of the creeks crossing the project.

3.13.1 Madrone Channel

The channel downstream of the project is concrete lined and would not be impacted with the increase in runoff due to the added impervious area. Based on the channel conditions, this outfall would not be considered susceptible to the hydromodification impacts.

3.13.2 Coyote Creek

Coyote Creek contains a dense network of more than 900 miles of unnatural channels including storm drains, engineered channels, and ditches. Historically, permeable valley soils allowed stormwater runoff and floodwaters in the valley to recharge the local underground aquifers. However, there has been an almost ten-fold increase in miles in terms of the total drainage network distance, including storm drain pipes, constructed channels and ditches. These changes to the drainage network have resulted in hydrologic changes, a reduction in groundwater recharge, increased runoff peak flows, and loss of associated floodplains, wetlands, and past natural buffers.

Detailed assessments of the Coyote Creek outfalls are critical to the project because the southern portion of the project lies in the middle and upper Coyote Creek watershed, which is considered susceptible to hydromodification impacts. The creek is considered susceptible because, based on the HMP map, it is not in an area designated as tidally influenced or where the watershed area is composed of greater than or equal to 65% impervious area.

The following section explains the susceptibility of the four separate US 101 crossings of Coyote Creek. Because Upper Silver Creek and Lower Silver Creek drain into Coyote Creek within a short distance after crossing the US 101 alignment, the susceptibility of the water bodies to hydromodification impacts are included under the Coyote Creek section as follows. Figure 6 shows the locations of the creek crossings within the Coyote Creek watershed.

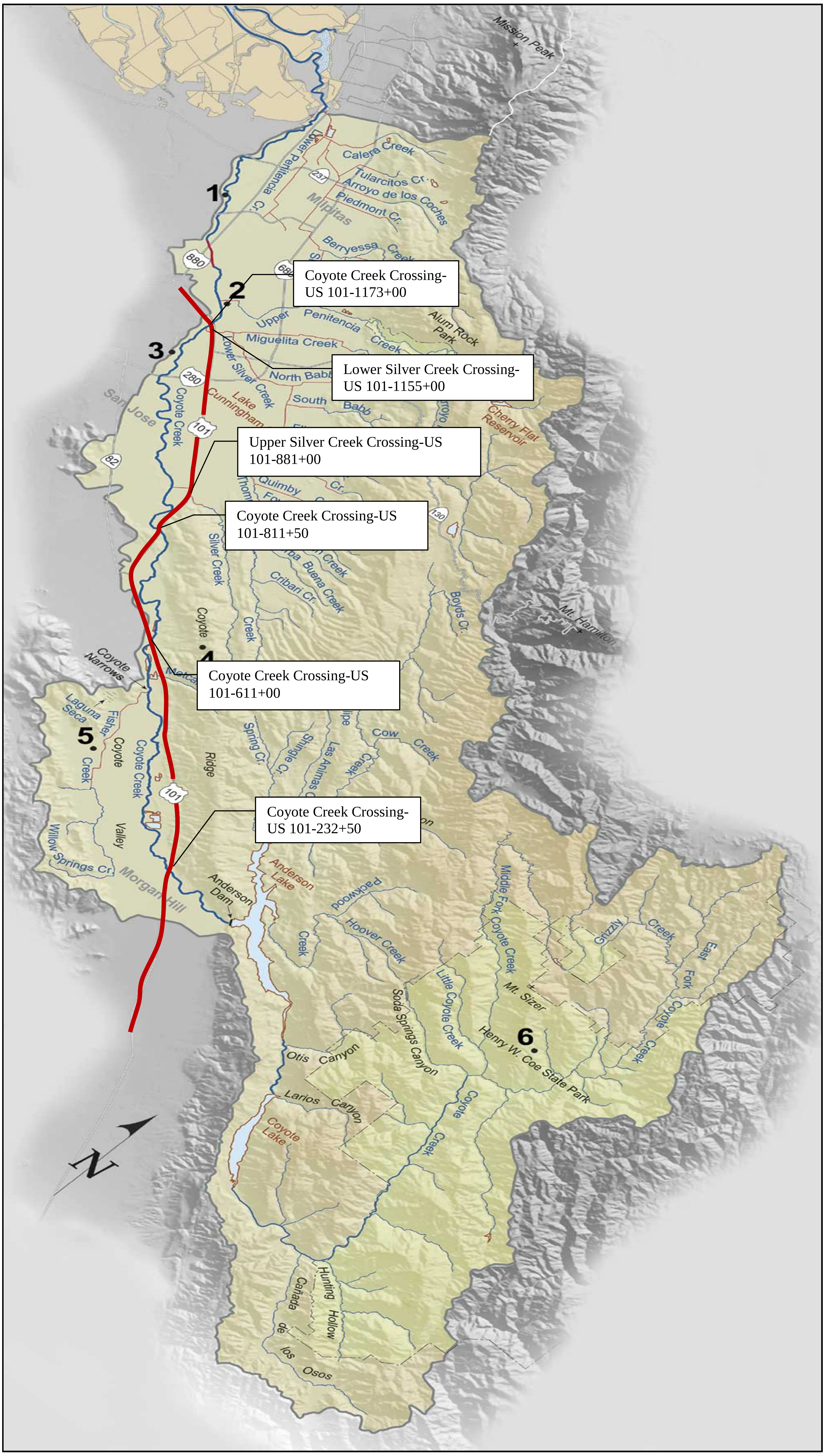


Figure 6. Creek Crossings in the Coyote Creek Watershed

Source: Oakland Museum Maps- Accessed January, 2011

3.13.2.1 Coyote Creek at US 101 (Station US 101-232+50)

At this location, Coyote Creek is the southernmost creek crossing within the project alignment. The channel flows in a natural setting, meandering north toward the South San Francisco Bay. Per the HMP map, this outfall lies in the area which is considered susceptible to hydromodification. As shown in Photo 1 and Photo 2, at the bridge location, the channel bed appears to be stable and armored, and banks have sparse to moderate vegetation. Downstream of the crossing, the vegetation appears to be well established on the banks. Certain sections of the channels under the bridge have exposed side slopes in the existing condition (based on the visual analysis, Photo 5), and these sections are prone to hydromodification impacts with the increase in surface runoff. A detailed channel stability analysis will be needed during the design phase of the project to determine the impacts on this outfall due to the project.

Photo 1. Coyote Creek, looking downstream (Station US 101-232+50)

Photo 2. Coyote Creek, at the bridge crossing (Station US 101-232+50)

3.13.2.2 Coyote Creek at US 101 (Station US 101-611+00)

At this US 101 crossing, Coyote Creek is a partially straightened gravel and earth channel (Photo 3 and Photo 4). Directly upstream and downstream of the bridge crossing, Coyote Creek is moderately to heavily vegetated (Photo 5). However, this vegetation does not extend underneath the bridge. There is some evidence of aggradation at the downstream end of the US 101 bridge crossing. Some undercutting was also observed downstream of the US 101 bridge location and under the bridge as shown in Photo 3. Because the outfall is in an area that is considered susceptible to hydromodification impacts (see HMP map- Figure 5), and the channel conditions appear to be sensitive to the changes to the incoming runoff, the channel will be susceptible to hydromodification. The detailed susceptibility and mitigation analysis will be performed for this outfall location during the design phase of the project.

Photo 3. Coyote Creek under US 101, looking upstream (Station US 101-611+00)

Photo 4. Coyote Creek under US 101, looking downstream (Station US 101-611+00)

Photo 5. Coyote Creek, looking downstream (Station US 101-611+00)

3.13.2.3 Coyote Creek at US 101 (Station US 101-811+50)

At this US 101 crossing, Coyote Creek is a natural earth channel (Photo 6) directly upstream and downstream of the bridge crossing. The banks of the channel are sparsely to moderately vegetated at the project location. Some signs of erosion were observed downstream of the US 101 bridge location and under the bridge as shown in Photo 6. Because the outfall is in an area that is considered susceptible to hydromodification impacts (see HMP map - Figure 5), and the channel conditions appear to be sensitive to the changes to the incoming runoff, the channel will be susceptible to hydromodification. A detailed susceptibility and mitigation analysis will be performed for this outfall location during the design phase of the project.

Photo 6. Coyote Creek at US 101 (Station US 101-811+50)

3.13.2.4 Upper Silver Creek at US 101 (Station US 101-881+00)

Upper Silver Creek is a trapezoidal concrete lined channel both upstream and downstream of the US 101 crossing (see Photo 7 and Photo 8). The increase in surface runoff due to added impervious area will not be erosive to the channel bed and banks due to the concrete lining; thus, this outfall will be considered exempt from hydromodification mitigation requirements.

Photo 7. Upper Silver Creek culvert upstream of the US 101 crossing.

Photo 8. Upper Silver Creek culvert downstream of the US 101 crossing.

3.13.2.5 Lower Silver Creek at US 101 (Station US 101-1155+00)

Lower Silver Creek (Photos 9 through 11) has a history of severe flooding that has resulted in damage to residential, commercial and industrial properties as well as erosion of the creek's banks and levees. The SCVWD, in partnership with the NRCS, initiated design and construction of a flood protection project in 2002. In 2006, improvements in the Lower Silver Creek reach under the US 101 bridge were completed. In addition to flood protection, the completion of this project provided enhanced habitat and vegetation that provided channel stability and improved water quality for the creek.

Per the HMP map, the channel at and downstream of the project alignment has a watershed composition of more than 65% impervious area and is thus not considered to be susceptible to hydromodification impacts.

Photo 9. Lower Silver Creek crossing downstream of the US 101 crossing looking toward the US 101 bridge.

Photo 10. Lower Silver Creek upstream of the US 101 crossing

Photo 11. Lower Silver Creek, upstream face of the US 101 bridge crossing.

3.13.2.6 Coyote Creek at US 101 (Station US 101-1173+00)

Coyote Creek at this crossing location is a natural channel with well vegetated banks upstream and downstream of the bridge site. However, at the bridge site, signs of localized erosion were witnessed during the field visit (Photo 12). In the existing condition, there is a scour hole at the upstream end of the pier (Photo 13), which could have been caused due to the formation of vortices in the area. The channel may have some existing erosion issues; however, increases in runoff due to the project would pose a low risk to the channel. Per the HMP map, the channel at and downstream of the project alignment has a watershed composition of more than 65% impervious area, and added impervious area due to the project will not significantly impact the creek's hydrograph; thus, it is considered exempt from hydromodification mitigation requirements.

Photo 12. One of the spans of US 101 Bridge in Coyote Creek (Station US 101-1173+00).

Photo 13. Scouring at a pier in Coyote Creek (Station US 101-1173+00).

3.13.3 Guadalupe River (Station US 101-1357+50)

Guadalupe River is conveyed under US 101 through a 142 foot long by 174 foot wide four-span bridge. It also crosses the US 101 northbound on-ramp through a 176 foot long by 50 foot wide dual-span bridge. On either side of the channel, there is moderate to heavy riparian vegetation (Photo 14 and Photo 15). Historically, both sedimentation and erosion have been problems along stretches of the Guadalupe River. However, the channel at and downstream of the project alignment has a watershed composition of more than 65% impervious area and is thus not considered to be susceptible to hydromodification impacts.

Photo 14. Guadalupe River looking upstream at the US 101 Bridge crossing.

Photo 15. Guadalupe River downstream of the US 101 crossing.

3.13.4 San Tomas Aquino Creek (Station US 101-1465+60)

At the US 101 crossing (Photo 16), San Tomas Aquino Creek is conveyed through a 92 foot long by 166 foot wide three-span bridge. Both upstream and downstream of the crossing, the creek flows within a natural channel. The channel upstream and downstream of the bridge is natural, with moderate to dense vegetation along the banks and meandering thalweg.

The San Tomas Aquino Creek crossing lies in an area that is designated as tidal on the HMP Map; therefore, the outfall is not considered to be susceptible to hydromodification.

Photo 16. San Tomas Aquino Creek, looking upstream toward the US 101 bridge

3.13.5 Calabazas Creek (Station US 101-1522+00)

Calabazas Creek is conveyed in a natural channel both upstream and downstream of the bridge, but under the bridge, the channel appears to be lined with straight concrete walls/ abutments (Photo 17). Volumes of fluvial sediments have deposited in the outermost spans through portions of Calabazas Creek at the crossing. Downstream of the bridge, Calabazas Creek transitions to a natural channel with vegetated banks (Photo 18). The crossing lies in an area that is designated as tidal on the HMP Map; therefore, the outfall is not considered to be susceptible to hydromodification.

Photo 17. Calabazas Creek under the US 101 bridge

Photo 18. Calabazas Creek looking downstream from the US 101 bridge

3.13.6 Sunnyvale East Channel (Station US 101-1594+10)

The Sunnyvale East Channel is an engineered, man-made channel, with a quarter of it being an underground culvert system. The Sunnyvale East Channel drains to Lower South San Francisco Bay via the Junipero Serra Channel and the Guadalupe Slough. At the US 101 crossing (Photo 19 and Photo 20), the flow is conveyed through a single box culvert on the upstream end and transitions to double box culvert system at the downstream end. The crossing lies in an area that is designated as tidal in the HMP Map; therefore, the outfall is not considered to be susceptible to hydromodification.

Photo 19. Sunnyvale East Channel upstream of US 101 crossing

Photo 20. Sunnyvale East Channel downstream of the Project Site.

3.13.7 Sunnyvale West Channel (Station US 101-1656+70)

The Sunnyvale West Channel is an engineered, man-made channel, with a quarter of it being an underground culvert system. The channel drains to San Francisco Bay via the Moffett Channel and then the Guadalupe Slough. At the US 101 crossing (Photo 19 and Photo 20), the flow is conveyed through a single box culvert. The crossing lies in an area that is designated as tidal in the HMP Map; therefore, the outfall is not considered to be susceptible to hydromodification.

Photo 21. Sunnyvale West Channel

3.13.8 Stevens Creek (Station US 101-1771+30)

Stevens Creek flows in a defined channel through Cupertino, Los Altos, Sunnyvale, and Mountain View, and outfalls into the South San Francisco Bay north of Moffett Field. As it flows through the city of Mountain View, much of the creek is channelized with artificial materials used for bank stabilization and flood control. The crossing lies in an area that is designated as tidal on the HMP Map; thus, the outfall is not considered to be susceptible to hydromodification.

3.13.9 Permanente Creek (Station US 101-1832+00)

Permanente Creek is a rectangular concrete lined channel upstream of the RCB culvert crossing (Photo 22) and has very flat slopes of 0.1%. The end of the transition from the concrete lined channel to the earthen channel takes place approximately 200 feet downstream from the cross culvert (Tetra Tech 2006). The crossing lies in an area that is designated as tidal in the HMP Map; thus, there will be no hydromodification impacts due to the construction of the project.

Photo 22. Permanente Creek at box culvert under US 101 (looking upstream)

3.13.10 Adobe Creek (Station US 101-1909+70)

Adobe Creek flows in a natural channel with moderate to steep slopes within the City of Los Altos and Town of Los Altos Hills. In the City of Palo Alto, Adobe Creek travels in a wide rectangular concrete channel with very flat slopes. The slope of the channel within the project area is less than 0.1%. At the downstream end of its US 101 crossing (Photo 23), Adobe Creek discharges to Charleston Slough, which eventually outfalls to the San Francisco Bay. The Adobe Creek crossing lies in an area that is designated as tidal on the HMP Map; thus, there will be no hydromodification impacts due to the construction of the project.

Photo 23. Adobe Creek at bridge under US 101 (looking upstream)

3.13.11 Matadero Creek (Station US 101-1947+00)

Matadero Creek flows in a natural channel with steep slopes through the unincorporated areas of Santa Clara County. In the City of Palo Alto, Matadero Creek travels in a U-shaped concrete channel with relatively flat slopes. This creek is a concrete lined channel at the US 101 crossing (Photo 24). At the downstream end of the project site, Matadero Creek discharges into the Palo Alto flood basin, which eventually outfalls to the San Francisco Bay. This area is a straightened, earthen bed channel with a longitudinal slope of less than 0.1%. The channel downstream of US 101 lies in a tidally influenced area; thus, the channel is not considered to be susceptible to hydromodification.

Photo 24. Matadero Creek entering the bridge under US 101 (looking downstream)

3.14 Existing Groundwater Resources Environment

The project extends through various groundwater sub-basins based on the SFBRWQCB and CCRWQCB Basin Plans. Based on examination of Geographic Information Survey (GIS) and information from the SWRCB, a majority of the project is located within the Santa Clara Valley groundwater basin and Santa Clara sub-basin (basin identification number 2-9.02), and a small segment lies at the south end in the Gilroy-Hollister Valley basin and Llagas area sub-basin. See Figure 7 for the basin locations.

The Santa Clara Valley sub-basin is in the northern part of Santa Clara County and extends from Coyote Narrows at Metcalf Road to the County's northern boundary. The sub-basin is bounded by the Diablo Range on the east and the Santa Cruz Mountains on the west. The Santa Clara Valley sub-basin is approximately 22 miles long and 15 miles wide, with a surface area of 225 square miles. The northern areas of the sub-basin are categorized as a confined zone and are overlaid with a series of clay layers resulting in a low permeability zone. The southern area of the sub-basin is an unconfined zone, or forebay, where the clay layer does not restrict recharge.

The Gilroy-Hollister Valley basin lies between Diablo Range to the east and the Gabilan Range and the Santa Cruz Mountains to the west. It is bounded on the southwest by the San Andreas Rift Zone. The Llagas subbasin extends from the groundwater divide at Cochran Road near the city of Morgan Hill in the north to the Pajaro River in the south. A portion of the project lies in the northern portion of the basin that is drained toward Monterey Bay by the Pajaro River and its tributaries.

Per the SCVWD Groundwater Management Plan, from the early 1900s through the mid 1960s, the water level declined more than 200 feet due to groundwater pumping-induced subsidence in this basin. To replace the water pumped, the SCVWD recharges the sub-basin with local and imported water via 393 acres of percolation ponds. With the importation of surface water via the Hetch Hetchy Aqueduct and South San Francisco Bay Aqueduct and the introduction of an artificial recharge program, the water levels have increased since 1965. The recharging of the sub-basin not only helped maintain the groundwater supplies, but also helped with land subsidence problems. The groundwater quality of the Santa Clara Valley sub-basin is generally of bicarbonate type with sodium and calcium as the principal cations.

Per the Urban Water Management Plan (2010), the overall groundwater quality in Santa Clara County is very good, and water quality objectives are achieved in most wells. The SCVWD monitors groundwater quality to assess current conditions and identify trends or areas of special concern. Wells are monitored for major ions, such as calcium and sodium, nutrients such as nitrate, and trace elements such as iron. Wells are also monitored for man-made contaminants, such as organic solvents.

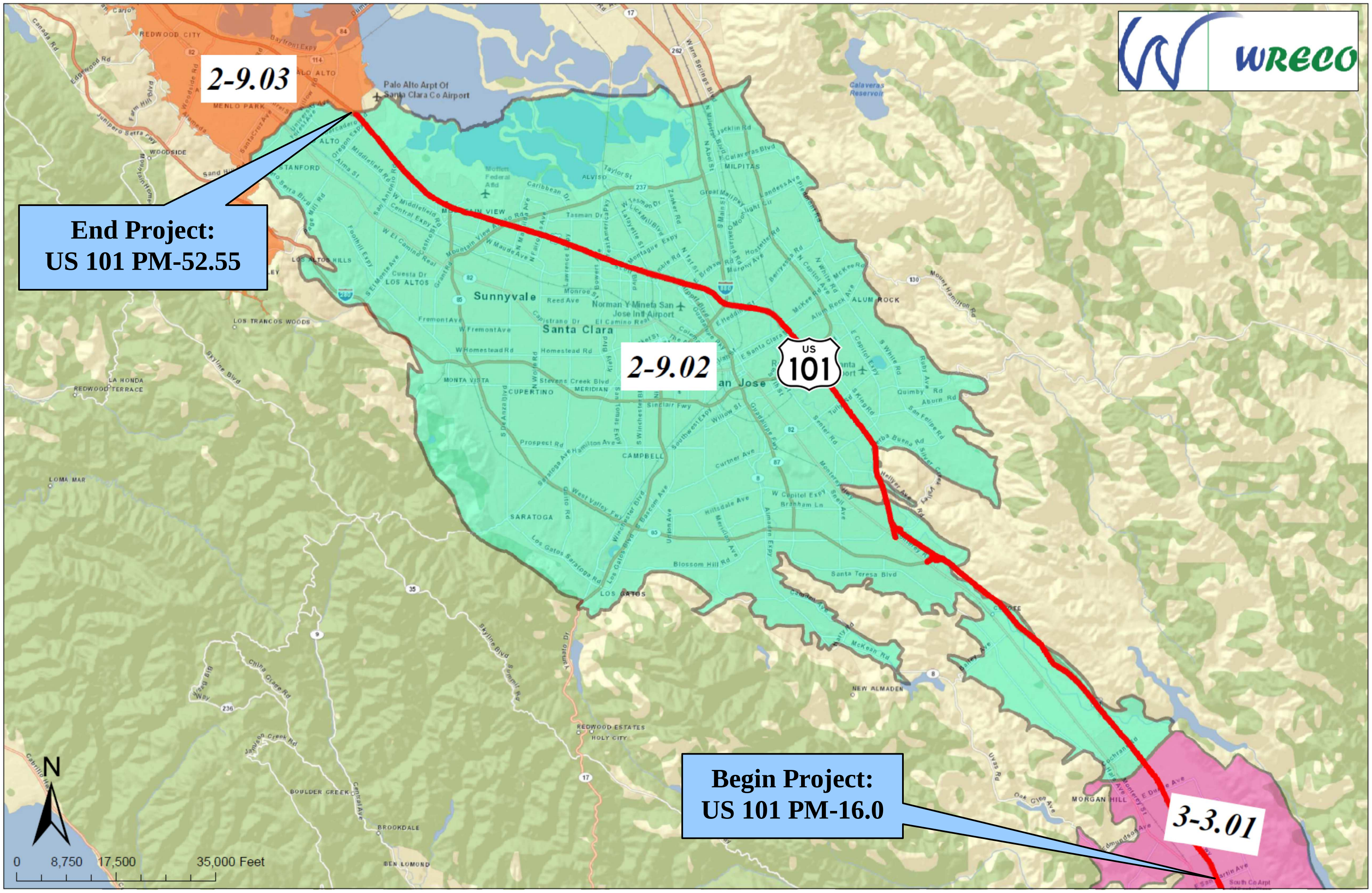


Figure 7. Groundwater Basin Map in the vicinity of the Project.

Source: California Department of Water Resources- Accessed in January 2011

3.14.1 Study Area and Recharge Areas

The project is in the San Francisco Bay Hydrologic Region. The SCVWD operates several percolation ponds for recharging groundwater facilities. The channels associated with this project that have offstream recharge facilities are Stevens Creek, Guadalupe River, and Coyote Creek.

URS performed a geotechnical study more specific to the project that provided additional information on groundwater resources. They conducted a groundwater study within the proposed US 101 improvement segment based on historic boring data, as-built information, current topography, and geologic information. Per the report, groundwater was existent from approximately 4 feet below ground surface (bgs) near the northern segment of the project to approximately 75 feet bgs near the Bernal Road crossing. Table 8 shows the locations and groundwater elevations and provides brief descriptions of sub-soil characteristics and compositions (URS 2011).

Table 8. Groundwater Information at Various Locations Within the Project Limits

Bridge/Structure	Groundwater Condition
Dunne Avenue Overcrossing	Groundwater measured at a depth of 34 ft below ground surface during August 20, 1998 investigation.
East Main Overcrossing	Groundwater measured at a depth of 44 ft below ground surface during June 27, 1968 investigation.
Cochrane Road Overcrossing	Groundwater not measured.
Cochrane Road to Metcalf Road	Groundwater encountered from elevations 239 to 344 ft. Groundwater level is anticipated to vary because of seasonal groundwater fluctuations, surface and subsurface flow, ground surface runoff and other factors.
Metcalf Road to Blossom Hill Road Native Soils and Bedrock	Groundwater encountered at time of exploration from 23 to 78 feet below ground surface. Perched groundwater may be encountered at shallower depths during construction.
Bernal Road Undercrossing	Groundwater encountered at depths of 50 ft and 75 ft below ground surface. Historic groundwater levels have been as shallow as 15 to 20 feet below ground surface.
Blossom Hill Road (SR 82/US 101) Separation	Groundwater depths range from 15 to 25 ft below ground surface.
Bernal Road to South of Coyote Creek	No free groundwater encountered at time of exploration.
Coyote Creek Bridge (No. 37-346 L)	Groundwater encountered at depths of 23 ft and 34 ft below ground surface. Groundwater levels are controlled primarily by water levels in Coyote Creek; historic records indicate groundwater levels have been as high as a few feet below ground surface.
Coyote Creek Bridge (No. 37-346 R)	Groundwater encountered at depths of 32 ft, 23 ft, and 51 ft below ground surface. Groundwater levels are controlled primarily by water levels in Coyote Creek; historic records indicate groundwater levels have been as high as a few feet below ground surf
South of Station US101 168+00	Groundwater encountered approximately 10 to 15 ft below ground surface. Soils in vicinity of groundwater appear to be potentially liquefiable.
I-280/680 to McKee Road	Free groundwater not encountered in exploratory borings.
McKee Road and South of Berryessa Road	Free groundwater not encountered in exploratory borings.
San Antonio Street Overcrossing	Free groundwater encountered at depths of approximately 24 to 38.5 ft below ground surface.
Julian Street/McKee Road Overcrossing Embankments	Free groundwater encountered at 24 ft below ground surface in most locations.
Coyote Creek Bridge Embankments	Free groundwater encountered at a depth of approximately 50 to 53 ft below ground surface.
Mabury Road/Taylor Street Overcrossing Embankments	Free groundwater encountered at depths of approximately 24 to 70 ft below ground surface.
Union Pacific Railroad Underpass Eastern Embankment	Free groundwater encountered at a depth of 20 ft below ground surface at time of exploration.
Union Pacific Railroad Underpass Western Embankment	Free groundwater encountered at a depth of 24 to 26 ft below ground surface at time of exploration.
Silver Creek Bridge Embankments	Free groundwater encountered at depths of 22 t o25 feet below ground surface.
Hedding Street to I-880 Roadway	Groundwater depths range from approximately 5 ft to 45 ft below ground surface.
Hedding Street/Berryessa Road Overcrossing Embankments	Groundwater estimated at elevation 40.
Old Oakland Road Overcrossing Embankments	Groundwater encountered from elevations 28 to 35 ft.
North Tenth Street Overcrossing Embankments	Groundwater levels at approximately elevation 30 ft.
Fourth Street on-ramp to US 101/I-880 Interchange Embankments	Groundwater measured at Elevations 21 to 34 ft at time of exploration.
North Fourth Street to Guadalupe River Roadway	Free groundwater not encountered at time of exploration.
Proposed US 101 Embankments adjacent to Brokaw Road	Free groundwater encountered at average elevation of 11 ft at time of exploration.
SR 87/US 101 Northbound Ramp Embankments	Free groundwater encountered at depths 23 to 34 ft below ground surface at time of exploration.
Guadalupe River Bridge Embankments	Free groundwater encountered at 18.5 ft below ground surface at time of exploration.
Eastern and Western Embankments along US 101 R/W	Free groundwater encountered at depths approximately 13 to 21 ft below ground surface at time of exploration.
Lafayette Street Overcrossing	Groundwater measured at depths of 9 and 10 ft during June 1956 explorations.
San Tomas Aquino Creek Bridge	Groundwater encountered at depths 14 ft below ground surface during October 1977 borings, and at depths 12.5 and 13.5 ft below ground surface during November 1973 borings.
Lawrence Expressway Overcrossing	Groundwater measured in 1995 and 1956 borings at depths 8.5 to 24 ft below ground surface.
Fair Oaks Avenue Overcrossing	Groundwater measured at 3 ft below ground surface during 1958 exploration.
Moffett Field Depressed Track to Moffett Field Station	Groundwater encountered at depths ranging from 6 to 17.5 ft below ground surface.
Moffett Field Overhead	1955 and 1956 explorations indicate groundwater is encountered from elevations 8.7 to 10.4 ft.
North Shoreline Boulevard to Embarcadero Road	Groundwater levels in northern section expected to be around elevations 2 to 4 ft, similar to the eater surface elevation in Matadero and Adobe Creeks. Towards southern end, groundwater elevation varies from elevations 4 to 15 ft, and is most likely subj

3.14.2 Local Area Springs and/or Wells

SCVWD manages the groundwater basin that underlies Santa Clara Valley and part of the Gilroy-Hollister Valley Basin to ensure that sufficient water is present to enable the owners of wells to withdraw the water they need without causing land subsidence. Various measures are implemented by the SCVWD to protect the quality of groundwater. There are about 6,700 registered public and private supply wells in Santa Clara County (SCVWD 1995).

3.14.3 Objectives for Groundwater Quality and Local Groundwater Constituents

The San Francisco Bay and Central Coast RWQCB's Basin Plans set general water quality objectives addressing bacteria, organic and non-organic chemical constituents, taste and odor, and radioactivity for all groundwater in the area. The Basin Plans state that: 1) groundwater shall be free of organic and inorganic chemical constituents in concentrations that adversely affect beneficial uses; 2) groundwater shall not contain taste or odor producing substances in concentrations that adversely affect beneficial uses; and 3) radionuclides shall not be present in concentrations deleterious to humans, plants, animals, or aquatic life. Table 9 shows a list of the sub-basins and the corresponding beneficial values. Appendix A summarizes water quality objectives based on beneficial uses established by the San Francisco Bay and Central Coast RWQCBs.

According to the PGR, groundwater depths vary within the project area. The water table on the northern end of the project is high (4 feet bgs). The project's Initial Site Assessment Report (URS 2011) assumed that groundwater within the project area in general flows toward the San Francisco Bay, while local groundwater flow may be subject to local variations, tidal influence, and temporary changes. Groundwater information will be updated once more specific information is available from the ongoing geotechnical studies.

Table 9. Groundwater Beneficial Uses

Groundwater Basin Name	Groundwater Sub-Basin	Basin Number	Beneficial Uses			
			MUN	PROC	IND	AGR
Santa Clara Valley	San Mateo Plain	2 – 9.03	E	E	E	P
Santa Clara Valley	Santa Clara	2 – 9.02	E	E	E	E
Gilroy – Hollister Valley	Llagas Area	3 – 3.01	E		E	E

Source: San Francisco and Central Coast Basin Plans

Notes:
MUN—Municipal and domestic water supply
PROC—Industrial process water supply
IND—Industrial service water supply
AGR—Agricultural water supply

E—Existing Beneficial Uses
P—Potential Beneficial Uses

3.15 Other Existing Water Quality Considerations

3.15.1 Biotic/Aquatic Considerations

Areas within the project limits that potentially contain biotic and aquatic species of significance are characterized by whether they are under the jurisdiction of the USACE, or the California Department of Fish and Wildlife (CDFW).

Per the NES (URS 2013), approximately 4.15 acres of potentially jurisdictional waters of the U.S. were identified in the biological study area (BSA). Of the 4.06 acres, approximately 0.89 acres are wetlands and 3.17 acres are non-wetland waters of the U.S. Waters within the BSA include perennial, intermittent and ephemeral streams, and freshwater wetlands. Non-wetland waters are regulated by the USACE under the federal CWA and the federal Rivers and Harbors Act; by the RWQCB under the CWA and the Porter-Cologne Water Quality Act; and by the CDFW under Section 1600 of the Fish and Game Code. Wetlands are regulated by the USACE under the CWA, the RWQCB and the Porter-Cologne Water Quality Act. Table 10 lists the potential jurisdictional wetland waters of the U.S. (WWUS) and other waters of the U.S. (WUS) in the BSA. For the locations corresponding to the labels in the table, see Figure 8.

Table 10. Jurisdictional Waters/Wetlands within the Biological Study Area

Feature Type and Label	Delineated Acres
Other Waters of the United States	
CWUS-1-Permanent Creek-culverted water	0.06
WUS-1-Coyote Creek	0.41
WUS-2-Ephemeral drainage	0.04
WUS-3-Intermittent drainage - canal	0.08
WUS-4-Intermittent stream	0
WUS-5-Ephemeral drainage	0
WUS-6-Ephemeral drainage	0
WUS-7-Ephemeral drainage	0
WUS-8-Ephemeral drainage	0
WUS-9-Ephemeral drainage	0
WUS-10-Ephemeral drainage	0
WUS-11-Intermittent stream	0.01
WUS-12-Coyote Creek	0.37
WUS-13-Ephemeral drainage to Coyote Creek	0.03
WUS-14-Coyote Creek	0.28
WUS-15-Intermittent drainage ditch	0
WUS-16-Ephemeral drainage ditch	0
WUS-17-Silver Creek	0.2
WUS-18-Coyote Creek	0.22
WUS-19-Guadalupe River	0.53
WUS-20-San Tomas Aquino	0.14
WUS-21-Calabazas Creek-intermittent drainage canal - concrete	0.07
WUS-22-Mathilda Channel	0.05
WUS-23-Stevens Creek	0.17
WUS-24-Stevens Creek	0.13
WUS-25-Intermittent stream	0.01
WUS-26-Intermittent stream	0.02
WUS-27-Ephemeral drainage	0.01
WUS-28-Ephemeral drainage	0.01
WUS-29-Ephemeral drainage	0.01
WUS-30-Ephemeral drainage	0
WUS-31-Intermittent stream	0.01
WUS-32-Ephemeral Drainage	0
WUS-33-Intermittent stream	0
WUS-34 -Matadero Creek	0.15
WUS-35-Adobe Creek	0.15
WUS-36-Permanente Creek	0.01
Subtotal	3.17
Wetlands	
WWUS-1 - Cattail wetland - in drainage ditch	0.02
WWUS-2 - Cattail wetland - in canal	0.01
WWUS-3 - Cattail wetland - perennial instream	0.04
WWUS-4 - Cattail wetland - Instream wetland	0
WWUS-5 - Freshwater marsh - Perennial wetland	0.06
WWUS-6 - Perennial instream wetland -Coyote Creek	0.05
WWUS-7 - Perennial instream wetland - Coyote Creek	0.44
WWUS-8 - Cattail-willow wetland - drains to Coyote	0.2
WWUS-9 - Cattail-willow wetland in ditch	0.01
WWUS-10 - Seasonal wetland - bulrush - to Guadalupe River.	0.02
WWUS-11 - Cattail-bulrush - in stream perennial wetland	0.04
Subtotal	0.89
Total Waters of the United States	**4.06**

Source: URS

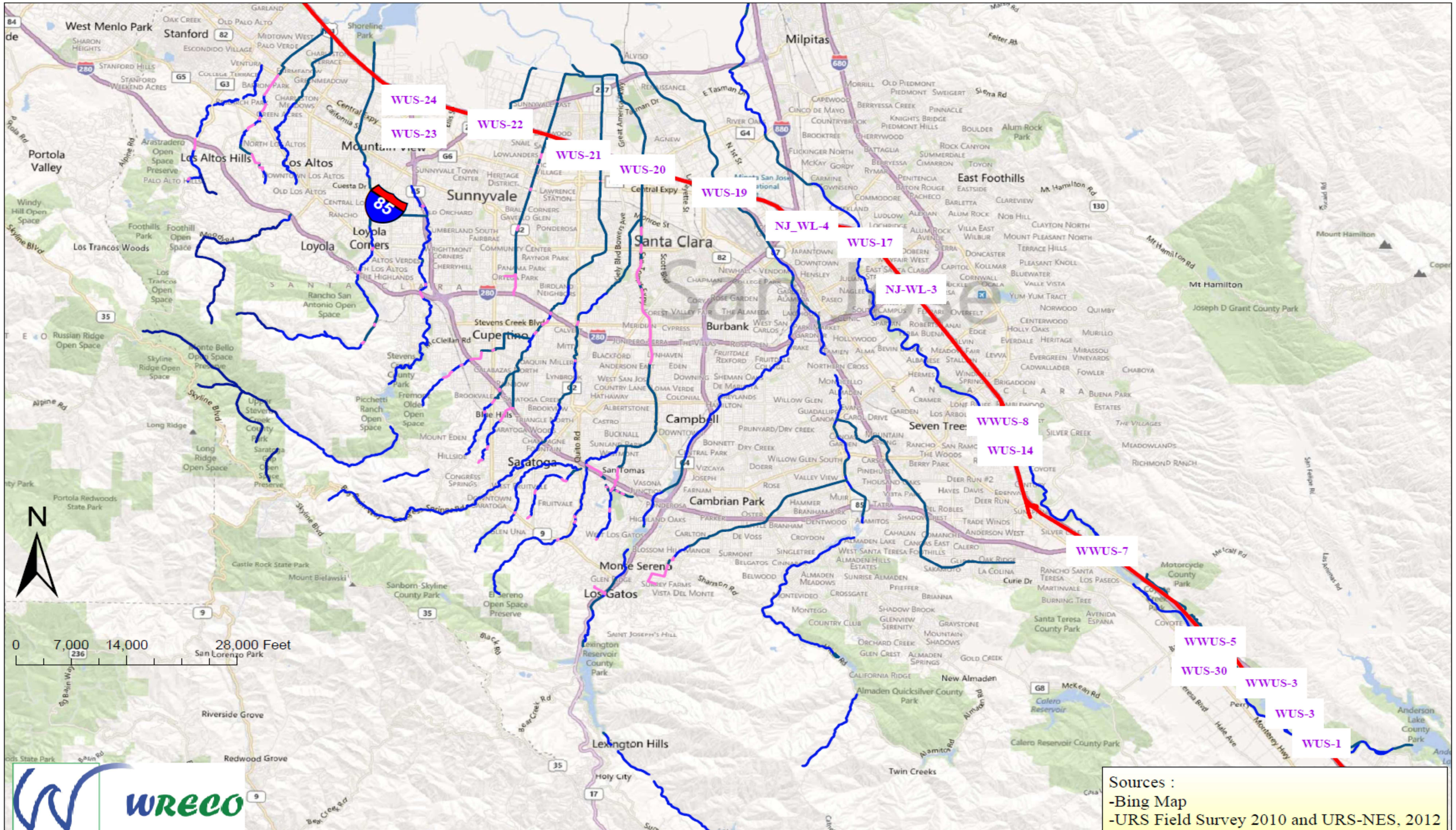


Figure 8. Feature Type and Location Map for the Wetlands (WWUS) and the Waters (WUS) of the United States.

4 ENVIRONMENTAL CONSEQUENCES AND PROJECT IMPACTS

The following sections present potential temporary and permanent water quality impacts anticipated from the proposed project activities. The discussions include Caltrans' procedures for identifying potential impacts.

4.1 Temporary Impacts to Stormwater

During construction, the Build Alternative for the project has the potential for temporary water quality impacts due to grading activities and removal of existing vegetation, which can cause increased erosion. Stormwater runoff from the project site may transport pollutants to nearby creeks and storm drains if BMPs are not properly implemented. Stormwater runoff drains into the creeks listed in Table 4 and eventually discharges to Lower South San Francisco Bay or Monterey Bay. Generally, as the disturbed soil areas (DSAs) increase, the potential for temporary water quality impacts also increases. The proposed project has an estimated DSA of 220 acres. Based on the preliminary calculated area, the project will have potential water quality impacts during construction.

Fueling or maintenance of construction vehicles will occur within the project site during construction, so there is risk of accidental spills or releases of fuels, oils, or other potentially toxic materials. An accidental release of these materials may pose a threat to water quality if contaminants enter storm drains, open channels, or surface water receiving bodies. The magnitude of the impact from an accidental release depends on the amount and type of material spilled.

4.2 Temporary Impacts to Groundwater

The Build Alternative does not propose to widen bridges over creeks or construct walls or conduct deep excavation in creeks; therefore, dewatering will not be anticipated at the creek locations. However, based on preliminary geotechnical information, construction dewatering would be anticipated at other locations due to excavation for the construction of the new retaining wall footings or for bridge footings of other bridges to be widened where shallow groundwater depths (where groundwater is about 3 to 10 feet bgs) are anticipated. More detailed information about the potential dewatering locations can be obtained from the PGR (URS 2013). A dewatering plan will be required as part of the Contractor's SWPPP for any dewatering proposed. Water quality sampling and analysis will be required prior to any discharge into the drainage system or downstream receiving water bodies.

BMPs such as temporary desilting basins or tanks can be used to provide water pollution control. For any contaminated groundwater, the water may be collected and off-hauled to a local sanitary sewer, or an active treatment system may be required to treat the water prior to discharge. More detailed information will be considered during the design phase of the project.

4.3 Temporary Impacts to Water Resources

The project does not propose widening at the bridge sites; therefore, temporary creek diversions will not be necessary. In addition, the project does not propose work that would require temporary diversion systems or dewatering at ephemeral channel locations. As stated in the NES (URS 2013), no impacts or fills are proposed from the project within the streams or riparian habitats within the BSA. Therefore, the project does not pose any temporary impacts to water resources.

4.4 Permanent Impacts to Stormwater

The Federal Highway Administration (FHWA) found that street and highway stormwater runoff has the potential to affect receiving water quality. The nature of these impacts depends on the uses and flow rate or volume of the receiving water, rainfall characteristics, and street or highway characteristics. Heavy metals associated with vehicle tire and brake wear, oil and grease, and exhaust emissions are the primary pollutants associated with transportation corridors.

Generally, highway stormwater runoff has the following pollutants: Total Suspended Solids, nitrate nitrogen, Total Kjeldahl Nitrogen, phosphorous, ortho-phosphate, copper, lead and zinc (Caltrans 2003). Some sources of these pollutants are natural erosion, phosphorus from tree leaves, combustion products from fossil fuels, and the wearing of brake pads and tires. There are no known existing treatment BMPs along US 101 within the project limits to treat roadway runoff; therefore, the water quality of the receiving water bodies will still be affected by highway runoff as a result of this alternative.

Highway widening projects increase impervious areas and therefore potentially increase the volume and velocity of stormwater flow to downstream receiving water bodies. In addition, pollutant loading can also be increased. Stormwater runoff from the project drains into creek crossings beneath US 101. It also drains into nearby storm drain systems, which ultimately discharge into the San Francisco Bay and a small southern portion into the Monterey Bay. Stormwater runoff volumes and velocities from the project area are expected to increase with the implementation of the project due to the increase in impervious surfaces. The added impervious area is directly related to the potential permanent water quality impacts. The proposed increase in impervious area is estimated to be approximately 61 acres. Out of these 61 acres, 54 acres of the impervious area will be added to the receiving water bodies discharging to the San Francisco Bay, and 7 acres would be added to the receiving water body that ultimately discharges to the Monterey Bay.

However, in comparison with the overall watershed of the creeks, the increase in flow due to the proposed widening of the roadway will be less than significant (see Table 11); thus, the widening of US 101 will not pose a significant risk to water quality. The increase in roadway runoff will be minimal in comparison to the overall watersheds of the creeks (less than 0.028% at each crossing). Coyote Creek at stations US 101 232+50, 611+00 and 811+50 is potentially susceptible to hydromodification impacts due to increase in impervious area. The remaining receiving water bodies within the project limits are not susceptible to hydromodification impacts due to the catchment and subwatershed composition or due to catchments draining to hardened channels or tidal areas. The project's design goal is to maximize and promote infiltration and metering, or detain flows prior to discharge to receiving water bodies that are susceptible to hydromodification impacts (Coyote Creek at the three above mentioned locations) or to an MS4. By meeting this design goal, permanent water quality impacts are not expected to be significant.

Table 11. Added Impervious Area by Creek

Location	Crossing Station along US 101 alignment	Increased Impervious Area (ac)	Watershed Area (ac)	Increased Area (%)
Llagas Creek (south of project)	232+50	3.33	-N/A	-N/A
Coyote Creek	232+50	30.26	123520	0.024%
	611+00		131200	-N/A
	811+50	0.71	146560	-N/A
Upper Silver Creek	881+00	0.08	3520	-N/A
Silver Creek	1155+00	1.56	27840	0.006%
Coyote Creek	1173+00	0.39	186240	0.000%
Guadalupe River	1357+50	1.41	97920	0.001%
San Thomas Aquino Creek	1465+60	2.39	26752	0.009%
Calabazas Creek	1522+00	2.11	12224	0.017%
Sunnyvale East Channel	1594+10	1.09	3904	0.028%
Sunnyvale West Channel	1656+70	0.11	1792	0.006%
Stevens Creek	1771+30	0.10	23296	0.000%
Permanente Creek	1832+00		10112	-N/A
Adobe Creek	1909+70		8640	-N/A
Maladero Creek	1947+50		8704	-N/A
	Total=	**43.54**	**acres**	

4.5 Permanent Impacts to Groundwater

The proposed widening required for the project may have localized impacts to the flow of groundwater. Existing groundwater recharge areas within the project limits will be slightly affected due to the increase in impervious areas, which decreases the amount of area available for infiltration. However, the impacts will not be significant in comparison to the overall groundwater area and due to the highly variable nature of the existing groundwater flow paths. In addition, because groundwater resources in the area do not represent a sole source aquifer, no significant impacts to water quality in groundwater wells are anticipated.

4.6 Permanent Impacts to Water Resources

There would be no changes to the stream bank configurations and no loss of riparian habitat from the existing waterways due to the construction of the project. There are no bridge widenings or culvert extensions proposed in the waters of the U.S. Therefore, no permanent impacts to water resources are anticipated as a result of project-related construction activities (URS 2013).

5 AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

The project has one build alternative, which includes avoiding or minimizing environmental impacts while maintaining the project's need and purpose. By incorporating the following proposed avoidance, minimization, and mitigation measures, this project will have less than significant impacts to water quality.

5.1 Avoidance and or Minimization Measures for Water Resources

Per the NES Report (URS 2013), no permanent or temporary impacts to jurisdictional waters of the U.S. are anticipated due to the project. The project will maximize avoidance of ESAs that exist within or are adjacent to the project limits. Delineation of these areas can be achieved through field verification. Once verified, these locations will be delineated on all project contract plans. Measures will be employed to prevent any construction material or debris from entering surface waters or their channels. BMPs for erosion control will be implemented and be in-place prior to, during, and after construction, in order to ensure that no silt or sediment enters surface waters. The NES Report lists the proposed measures and BMPs in detail.

No construction work is anticipated in the jurisdictional areas. The avoidance measures would be implemented to minimize any impacts due to the project. Caltrans' Standard Specifications require the Contractor to submit a Storm Water Pollution Prevention Plan (SWPPP). This plan must meet the standards and objectives to minimize water pollution impacts set forth in section 7-1.01G of Caltrans' Standard Specifications. The SWPPP must also be in compliance with the goals and restrictions identified in the San Francisco Bay and Central Coast RWQCB's Basin Plans. In addition, the project will incorporate applicable measures specified in the Santa Clara Valley Habitat Conservation Plan HCP (CSC 2012). The project would implement any general Waste Discharge Requirements (WDRs) issued by the RWQCB.

More detailed information on the avoidance and minimization measures is provided in NES Report for the project (URS 2013).

5.2 Avoidance and or Minimization Measures for Stormwater and Groundwater

The overall design features for water quality impacts is a condition of Caltrans' NPDES permit with the SWRCB and other regulatory agencies' requirements. Implementation of details for these design features or BMPs will be developed and incorporated into the project design and operations prior to the project startup. With proper implementation of these design features or BMPs, short-term construction-related water quality impacts and permanent water quality impacts will be avoided or minimized.

5.2.1 Construction General Permit

In accordance with the CGP, a risk assessment to determine the project risk level is required for this project. Due to the length of the project and multiple receiving water bodies, multiple risk assessments were completed based on the project planning watersheds. Table 12 lists the planning watersheds and risk factors used to determine the risk levels for the project.

Table 12. Risk Assessment by Planning Watershed

Planning Watershed	R	K LS	Sediment Risk	Receiving Water Risk	Risk Level
Coyote Creek	84.03	2.3	High	High	3
Matadero Creek	86.08	2.3	High	High	3
Lower Silver Creek	84.03	2.3	High	Low	2
Upper Silver Creek	81.98	2.3	High	Low	2
Guadalupe River	92.23	2.3	High	Low	2
San Tomas Aquino Creek	94.28	2.3	High	Low	2
Calabazas Creek	94.28	2.3	High	Low	2
Sunnyvale West Channel	94.28	2.3	High	Low	2
Sunnyvale East Channel	94.28	2.3	High	Low	2
Stevens Creek	90.18	2.3	High	Low	2
Permanente Creek	86.08	2.3	High	Low	2
Adobe Creek	86.08	2.3	High	Low	2

The sediment risk factor is determined using the product of the rainfall runoff erosivity factor (R), the soil erodibility factor (K), and the length-slope factor (LS). The R factor was determined from the EPA's "Rainfall Erosivity Factor Calculator for Small Construction Sites," and the combined K and LS factor was determined to be 2.3 based on a GIS map prepared by Caltrans District 4. The sediment risk is high for all the planning watersheds because the product of the R, K, and LS factors is greater than 75.

The receiving water risk can be classified as medium or high. The receiving water risk was determined from the Caltrans "CGP Info" GIS mapping system. The receiving water risks are confirmed by examining whether the project's receiving water bodies are on the 303(d) List for sedimentation/siltation and/or have the beneficial uses of Cold Freshwater Habitat (COLD), Spawning, Reproduction, and/or Early Development (SPWN) and Migration of Aquatic Organisms (MIGR) (Table 3).

Based on the combined sediment and receiving water risk, this project has two high risk areas. The project is Risk Level 3 for areas draining to Coyote and Matadero creeks because they have both high sediment and high receiving water risks. All other areas are classified as Risk Level 2 because they have a high sediment risk and low receiving water risk.

The project risk level(s) will be further evaluated and verified during the PS&E phase.

5.2.2 Caltrans' Standard Procedures and Practices

The project is classified as a major reconstruction project because it has an estimated disturbed soil area of 220 acres. Measures will be considered to address potential temporary, as well as permanent water quality impacts. According to Caltrans' NPDES permit and the CGP, BMPs will be incorporated into the contract documents of this project to reduce the discharge of pollutants temporarily, during construction, and permanently, to the maximum extent practicable. Caltrans' Storm Water Handbooks, including the Project Planning and Design Guide (2010), provide guidance for evaluating projects to determine the need for and feasibility of BMPs, design pollution prevention BMPs, and permanent treatment BMPs. Construction site BMPs are implemented during construction activities to reduce pollutants in stormwater discharges throughout construction. Design pollution prevention BMPs are permanent measures to improve stormwater quality by reducing erosion, stabilizing DSAs, and maximizing vegetated surfaces. Treatment BMPs are permanent devices and facilities that treat stormwater runoff.

5.2.3 Project Construction

Because the project will involve soil disturbance of more than 1 acre, a Notification of Intent will need to be filed with the SWRCB's Storm Water Multiple Application and Report Tracking System (SMARTS). This project does not qualify for a low rainfall erosivity waiver. Caltrans will require its contractors to implement a SWPPP to comply with the conditions of the Caltrans' NPDES permit and to address the temporary water quality impacts resulting from the construction activities associated with this project.

The SWPPP will be submitted by the contractor and approved by Caltrans prior to start of construction. It is intended to address construction-phase impacts. The SWPPP required for this project will include the following elements:

- Project Description – The project description includes maps and other information related to construction activities and potential sources of pollutants.
- Minimum Construction Control Measures – These measures may include limiting construction access routes, stabilizing areas denuded by construction, and using sediment controls and filtration.
- Erosion and Sediment Control – The SWPPP is required to contain a description of soil stabilization practices, control measures to prevent a net increase in sediment load in stormwater, controls to reduce tracking sediment onto roads, and controls to reduce wind erosion.
- Non-Stormwater Management – The SWPPP includes provisions to reduce and control discharges other than stormwater.
- Post-Construction Stormwater Management – The SWPPP includes a list of stormwater control measures that will provide ongoing (permanent) protection for water resources.
- Waste Management and Disposal – The SWPPP includes a waste management section including equipment maintenance waste, used oil, batteries, etc. All waste must be disposed of as required by state and federal law.
- Maintenance, Inspection, and Repair – The SWPPP requires an ongoing program to ensure that all controls are in place and operating as designed.

- Monitoring – This provision requires documented inspections of the control measures.
- Reports – The contractor will prepare an annual report on the construction project and submit this report before July 14 each year. This report will be submitted on the SMARTS website to the SWRCB.
- Training – The SWPPP will provide documentation of the training and qualifications of the designated qualified SWPPP developer and qualified SWPPP practitioner. Trained personnel must do inspections, maintenance, and repair of construction site BMPs.
- Construction Site Monitoring Program – The SWPPP includes a Construction Site Monitoring Program detailing the procedures and methods related to the visual monitoring, sampling, and analysis plans for non-visible pollutants, sediment, turbidity, pH, suspended sediment concentration, and bioassessment.

To obtain permit coverage under the CGP, all dischargers must electronically file Project Registration Documents, Notice of Termination, changes of information, sampling and monitoring information, annual reporting, and other compliance documents required through the SWRCB's SMARTS.

Caltrans is required to reduce pollutants in stormwater discharges to the maximum extent practicable. For discharges from a construction site, pollutants must be reduced using the Best Available Technology Economically Achievable; and conventional pollutants must be reduced using the Best Conventional Technology.

5.2.4 List of Proposed Temporary Construction Site BMPs

Potential temporary impacts to water quality can be prevented or minimized by implementing standard BMPs recommended for a particular construction activity.

Adverse impacts can occur during construction-related activities. Soil erosion, especially during heavy rainfall, can increase the suspended solids, dissolved solids, and organic pollutants in stormwater runoff generated within the project area. These conditions will likely persist until completion of construction activities and implementation of long-term erosion control measures.

Erosion control measures can be applied to all exposed areas during construction, including the trapping of sediments within the construction area through the placing of barriers (such as silt fences) at the perimeter of downstream drainage points or through the construction of temporary detention basins. Other methods of minimizing erosion impacts include the implementation of hydromulching and/or limiting the amount and length of exposure of graded soil. In addition to these erosion control measures, the use of compost is strongly encouraged by Caltrans. Compost not only improves erosion resistance and vegetation establishment, but it also helps immobilize heavy metals that are commonly found on and near highways. Compost can be considered or specified at the design phase of the project.

Caltrans' Project Planning and Design Guide describes approved erosion control BMPs (2010). Temporary erosion control and water quality measures will be defined in detail in the Erosion Control and Water Pollution Control design sheets prepared for the project, which will also include the specifications for the SWPPP. The proposed construction site BMPs will be reviewed and approved by the Construction Stormwater Coordinator during the PS&E phase.

The project site may be adjacent to ESAs (URS 2013). If so, ESA provisions will be provided that may include, but are not limited to, the use of temporary high visibility fencing to delineate the proposed limit of work in areas adjacent to sensitive resources, or to delineate and exclude sensitive resources from potential construction impacts. Contractor encroachment into ESAs would be prohibited (including the staging/operation of heavy equipment or casting of excavation materials).

Based on preliminary geotechnical information (URS 2013), excavation to the groundwater level is anticipated to be encountered for the construction of new retaining wall footings or bridge footings of bridges to be widened. A dewatering plan will be required as part of the Contractor's SWPPP. Water quality sampling and analysis will be required prior to any discharge into the drainage system or downstream receiving water bodies.

BMPs such as temporary desilting basins or tanks shall be used to provide water pollution control. For any contaminated groundwater, the water may be collected and off-hauled to the local sanitary sewer, or an active treatment system may be required to treat the water prior to discharge. More detailed information will be considered during the design phase of the project.

None of the work is anticipated to take place in wetlands or waters of the U.S. or State; however, the contractor will be required to protect them when work is conducted in the adjacent areas.

Non-stormwater waste management is also essential to minimize the potential for water quality impacts on a project site. Accidental spills of petroleum hydrocarbons (such as fuels and lubricating oils), concrete wastewater, and sanitary wastes are also of concern during construction activities. An accidental release of these wastes can adversely affect surface water quality, vegetation, and wildlife habitat.

A spill on the roadway would trigger immediate response actions to report, contain, and mitigate the incident. The California Office of Emergency Services has developed a Hazardous Materials Incident Contingency Plan, which provides a program for response to spills involving hazardous materials. The plan designates a chain of command for notification, evacuation, response, and cleanup of spills. Caltrans also has spill contingency procedures and response crews.

Included in Table 13 are the suggested minimum temporary control BMPs that will be necessary for the project, per Caltrans' Project Planning and Design Guide. Further evaluation of the BMPs necessary for this project to comply with the CGP and Caltrans' permit will be detailed during the PS&E phase. Furthermore, during construction, the contractor will be required to detail in the SWPPP actual in-field implementation of BMPs and amend the SWPPP as necessary to match field conditions and phasing of the project.

Table 13. Temporary BMPs

Temporary BMP	Purpose	Cost Type
Soil Stabilization		
Move-In/Move-Out	Mobilization locations where permanent erosion control or re-vegetation to sustain slopes is required within the project.	Bid Item
Temporary Cover	Plastic covers for stockpiles.	Bid Item
Temporary Fence (Type ESA)	High visibility fence to designate areas off-limits to the contractor.	Bid Item
Sediment Control		
Temporary Fiber Rolls	Degradable fibers rolled tightly and placed on the toe and face of slopes to intercept runoff.	Bid Item
Temporary Silt Fence	Linear, permeable fabric barriers to intercept sediment-laden sheet flow. Placed downslope of exposed soil areas, along channels and project perimeter.	Bid Item
Temporary Gravel Bag Berm	Single row of gravel bags installed end to end to form a barrier across a slope to intercept runoff. Can be used to divert or detain moderately concentrated flows.	Bid Item
Temporary Check Dams	Small constructed device of rock or other product placed across a channel or ditch to reduce flow velocity.	Bid Item
Temporary Drainage Inlet Protection	Runoff detainment devices used at storm drain inlets that is subject to runoff from construction activities.	Bid Item
Tracking Control		
Temporary construction entrances/exits	Points of entrance/exit to a construction site that are stabilized to reduce the tracking of mud and dirt onto public roads.	Bid Item
Street Sweeping	Removal of tracked sediment to prevent it entering a storm drain or watercourse.	Bid Item
Non-Stormwater Management		
All other anticipated non-stormwater management measures are covered under the Construction Site Management lump sum**.**		
Waste Management and Materials Pollution Control		
Temporary Concrete Washout Facilities	Specified vehicle washing areas to contain concrete waste materials.	Bid Item
All other anticipated waste management and materials pollution control measures are covered under Construction Site Management lump sum.		
Construction Site Management		
Controlling potential sources of water pollution before these pollutants come in contact with stormwater systems or watercourses. Covers: • spill prevention and control • materials management • stockpile management • waste management • hazardous waste management • contaminated soil • concrete waste • sanitary and septic waste and liquid waste Non-stormwater management consists of:		Lump Sum

Temporary BMP	Purpose	Cost Type
• water control and conservation • illegal connection and discharge detection and reporting • vehicle and equipment cleaning • vehicle and equipment fueling and maintenance • material and equipment used over water • structure removal over or adjacent to water • paving, sealing, saw cutting and grinding operations • thermoplastic striping and pavement markers • concrete curing and concrete finishing Miscellaneous construction site management includes: • training of employees and subcontractors • proper selection, deployment and repair of construction site BMPs		

Several other temporary water quality or construction site BMPs are listed in Caltrans' Statewide Storm Water Management Plan, and each should be considered for inclusion as the design progresses. In addition to the temporary BMPs listed in the Table 13, the project would incorporate applicable measures specified in the HCP (CSC 2012).

5.2.5 Permanent Pollution Prevention Design Measures

In order to comply with the Statewide Permit (Order No. 99-06 DWQ), Caltrans will take measures to reduce, to the maximum extent practicable, pollutant loadings from the facility once construction is complete. The permit stipulates that permanent measures that control pollutant discharges must be considered and implemented for all new or reconstructed facilities. Permanent control measures located within Caltrans' right-of-way reduce pollutants in stormwater runoff from the roadway. These measures reduce the suspended particulate loads, and thus pollutants associated with the particulates, from entering waterways. The measures will be incorporated into the final engineering design or landscape design of the project and will take into account expected runoff from the roadway. In addition, the NPDES permit also stipulates that an operation and maintenance program be implemented for permanent control measures. This category of water quality control measures can be identified as including both design pollution prevention BMPs and treatment BMPs.

Many design elements that are traditionally part of highway, drainage, and landscape design for a project are considered beneficial to pollution prevention. Designers must consider all of the items listed below in the proper project design. In addition, the following elements should be considered with respect to the potential water quality impacts:

5.2.6 List of Proposed Design Pollution Prevention BMPs

- Consideration of downstream effects related to potentially increased flow –
  The project will discharge into unlined channels; therefore, necessary erosion control should be applied to the ditches. Increased sediment loads may be transported to downstream waterways; therefore, permanent erosion control measures should be applied to all new or exposed slopes.

- Preservation of existing vegetation – At all locations, preserving existing vegetation is beneficial. The following general steps should be taken to preserve existing vegetation during the design phase (Caltrans 2010):

    a) Identify and delineate in contract documents all vegetation to be retained.

    b) Provide specification in contract documents that the Contractor shall delineate the areas to be preserved in the field prior to the start of soil-disturbing activities.

    c) Provide specification in contract documents that the Contractor shall minimize disturbed areas by locating temporary roadways to avoid stands of trees and shrubs and to follow existing contours to reduce areas of cut and fill.

    d) When specifying the removal of vegetation, consider provisions to be included in the contract documents to minimize impacts (increased exposure or wind damage) to the adjacent vegetation that would be preserved.

- Concentrated flow conveyance systems – The project will:
    a) Have the potential to create water gullies
    b) Create or modify existing slopes
    c) Require the concentration of surface runoff
    d) Require cross drains

        Each of these conditions will require the proper design of these drainage facilities to handle concentrated flows:
        - Ditches, berms, dikes, and/or swales
        - Overside drains
        - Flared end sections
        - Outlet protection/velocity dissipation devices
- Slope/surface protection systems – The project will create or modify existing slopes requiring the application of one or more of the following control measures:
    a) Vegetated surfaces
    b) Hard surfaces

5.2.7 List of Proposed Treatment BMPs

This project is considering treatment BMPs because it is a major reconstruction project that directly or indirectly discharges to a surface water body and creates more than 1 acre of impervious surface.

Caltrans' July 2010 Project Planning and Design Guide provides updated guidance for determination of preferred treatment BMPs based on the estimated ability of a BMP to infiltrate the water quality volume. The methodology prefers the use of biofiltration devices that can potentially infiltrate over 90% of the water quality volume, using either native or amended soils. If biofiltration devices are estimated to infiltrate less than 90% of the water quality volume, then infiltration devices should be evaluated. If infiltration devices are estimated to infiltrate less than

90% of the water quality volume, then earthen BMPs (detention devices and Austin sand filters) should be evaluated for the percent of water quality volume infiltrated. The preferred treatment devices for this project will be biofiltration devices with amended soil or infiltration devices (if the device infiltrates over 90% of the water quality volume); otherwise, "BMP Selection Matrix A" of the Project Planning and Design Guide should be used. Based on preliminary treatment analysis, the feasible treatment BMPs for the project are biofiltration devices.

Potential treatment BMP locations are limited due to the following site conditions: Most of the project alignment has side slopes in cut, steep slopes, retaining/sound walls and vector control considerations. As such, the treatment of all newly created impervious areas is not currently feasible without further design efforts; further detailed drainage and stormwater design efforts will be made during the design phase to achieve the required treatment of impervious area.

5.2.8 Project Operation and Maintenance

Because Caltrans' Maintenance Unit is responsible for maintaining the US 101 Express Lanes and BMP facilities once the project is complete, the Maintenance Unit will be involved in the development process from conception through construction. The Maintenance Unit field representative has unique insight into local problems and maintenance and safety concerns. Caltrans' Maintenance Unit typically comments on the following project-related issues:

- Drainage patterns (particularly known areas of flooding, debris, etc.)
- Stability of slopes and roadbed (help determine if the project can be built and maintained economically)
- Possible material borrow or spoil sites
- Concerns of the local residents
- Existing and potential erosion problems
- Facilities within the right-of-way that would affect alternative designs
- Special problems such as deer crossings, endangered species, etc.
- Whether facilities are safe to maintain
- Known environmentally sensitive areas
- Frequency of traction sand use and estimate of sand quantity applied annually

The Maintenance Stormwater Coordinator will be involved in the design review of any permanent stormwater treatment BMPs and will need to approve any such devices at the end of the PS&E phase.

5.3 Water Quality Assessment Checklist

This Water Quality Assessment Checklist is a summary of the stormwater quality evaluation process presented in the California Environmental Quality Act (CEQA) Environmental Checklist Form.

The following list of questions is from the Hydrology and Water Quality Checklist from Section 8 of the CEQA Environmental Checklist Form. The possible answers are: "Potentially Significant Impact," "Less than Significant," "Less than Significant Impact," and "No Impact."

Would the Project:

a) *Violate any water quality standards or waste discharge requirements?*

Less than Significant Impact

The primary potential for impacts to water quality is soil erosion or suspended solids being introduced into the waterways. The proposed project has a proposed soil disturbance of 1 acre or more, and therefore shall be regulated under the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ, NPDES No. CAS000002). This CGP is also referenced in Caltrans' NPDES Permit, from the SWRCB (Order No. 99-06-DWQ, NPDES No. CAS000003). Stormwater discharges from Caltrans' transportation properties, facilities, and activities are regulated through this Permit. Minimization measures that comply with Caltrans' NPDES permit such as requiring the contractor to submit a SWPPP prior to start of construction and implementing permanent BMPs (such as erosion control and treatment BMPs in the project to address long-term impacts), will focus on the control of sediment and suspended solids from entering the waterways. Therefore, the proposed project will comply with all water quality standards and waste discharge requirements, and the impact to water quality will be less than significant.

b) *Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?*

Less than Significant Impact

Groundwater recharge is reduced when the ground is compacted or when it is covered completely (by development) so less water can seep into the soil. The additional impervious area is small in relation with the size of the groundwater basin located within the project limits; therefore, groundwater recharge impacts will be less than significant for the project.

c) *Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?*

Less Than Significant Impact

No stream or river will be altered such that substantial erosion or siltation would result. The objective of the drainage design is to limit the design water surface elevations and velocities to no greater than the existing conditions, or to what can be handled by the existing conditions, at the boundary of the proposed project. Long-term erosion and sediment controls will be addressed with the design permanent treatment BMPs. Short-term erosion and sediment controls will be addressed with the construction site BMPs. These BMPs will be implemented to ensure that sediment potential will not increase.

d) *Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?*

Less Than Significant Impact

Existing drainage patterns will remain. While the proposed project will introduce additional pavement/impervious surface area, the effect on the flow rate and amount of surface runoff will be negligible, as the project's NPDES permit (Order No. R2-2009- 0074) requires implementing measures to promote infiltration and to minimize the rate and amount of surface runoff discharging to receiving water bodies. The design goal of these measures would be to maintain pre-construction stormwater discharge flows by metering or detaining these flows prior to discharging to a receiving water body.

e) *Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?*

Less than Significant Impact

The project will increase the total impervious surface within the proposed project limits and, therefore, increase the volume of stormwater runoff. Drainage systems will be upsized as necessary. Potential sources of pollutants from the right-of-way include: total suspended solids, nutrients, pesticides, particulate metals, dissolved metals, pathogens, litter, biochemical oxygen demand, and total dissolved solids. Existing drainage facilities throughout the proposed project limits, however, will be extended, replaced, repaired, and/or improved as necessary to provide proper offsite and highway drainage. In compliance with Caltrans' NPDES requirements, water quality treatment BMPs will be included where practicable. These could include biofiltration devices with underdrains and soil amendments as necessary, detention basins, or media filters at various locations throughout the proposed project area. Therefore, the impact to runoff will be less than significant.

f) *Otherwise substantially degrade water quality?*

Less than Significant Impact

The project will follow the requirements set forth in the NPDES permits. These permits require the contractor to submit a SWPPP with the appropriate temporary and permanent BMPs to eliminate the degradation of water quality to the maximum extent practicable.

6 PERMITS AND COORDINATION

Permits from the following listed agencies are anticipated. Some of the agencies that issue these permits have differing jurisdiction over all or specific parts of the project, depending on the resources present at any one location along each project segment. Therefore, during the PS&E phase specific permit jurisdiction and requirements will be determined when the applications are prepared or sought.

- General Permit for Discharges of Storm Water from Municipal Separate Storm Sewer Systems from the cities of Gilroy, Morgan Hill, San Jose, Santa Clara, Sunnyvale, Mountain View, and Palo Alto.
- SWRCB CGP Order Number 2009-0009-DWQ, NPDES Number CAS000002.
- SWRCB, Caltrans' Statewide NPDES Storm Water Permit (Order Number 99-06-DWQ).

Work within creeks would be avoided during the construction of the project, so a CWA 401 Water Quality Certification would not be required from the SFBRWQCB. The SFBRWQCB joint Application for 401 Water Quality Certification and/or Report of Waste Discharge would be submitted because the project is subject to waste discharge requirements under the Porter-Cologne Water Quality Control Act.

7 REFERENCES

Association of Bay Area Governments (ABAG) (2009), Population Information. <http://www.abag.ca.gov/> (Last Accessed: August 31, 2011)

California Code of Regulations, Title 22, Division 4, Environmental Health. (December 3, 2010.) <http://www.cdph.ca.gov/certlic/drinkingwater/Documents/POU/DPH-10-009_POU%20Regulation_Text_2010-12-09.pdf >

California Department of Transportation. (March 2003). *Storm Water Quality Handbooks, Construction Site Best Management Practices (BMPs) Manual.*

California Department of Transportation. (July 2010). *Storm Water Quality Handbooks, Project Planning and Design Guide.*

California Department of Transportation. (March 2011). *Storm Water Quality Handbooks, Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual CTSW-RT-10-255.08.01.*

California Department of Transportation. (May 2003). *Statewide Storm Water Management Plan.*

California Department of Transportation, et al. *Water Quality Planning Tool.* <http://www.water-programs.com/wqpt.htm> (Accessed: January, 2012)

Environmental Protection Agency. *Rainfall Erosivity Factor Calculator*. <http://cfpub.epa.gov/npdes/stormwater/lew/lewcalculator.cfm> (Accessed: January, 2012)

Tetra Tech Inc. (March 2006). *West Valley Watershed Stewardship Plans*. Prepared for Santa Clara Valley Water District.

Tetra Tech Inc. (March 2006). *Guadalupe Watershed Stewardship Plans*. Prepared for Santa Clara Valley Water District.

Tetra Tech Inc. (September 2006). *Lower Peninsula Watershed Stewardship Plans*. Prepared for Santa Clara Valley Water District.

Santa Clara Basin Watershed Management Initiative (May 2000). *Watershed Management Plan Volume One: Watershed Characteristics Report.*

County of Santa Clara (CSC) (August 2012), Santa Clara Valley Transportation Authority, Santa Clara Valley Water District, the Cities of San Jose, Gilroy and Morgan Hill, the California Department of Fish and Game and the U.S. Fish and Wildlife Service. *Santa Clara Valley Habitat Conservation Plan* < http://scv-habitatplan.org/www/site/alias__default/346/final_habitat_plan.aspx> (Last Accessed: Sept 21, 2012)

Santa Clara Valley Water District (1998). *Report on Flooding and Flood Related Damages in Santa Clara County, February 2 through 9, 1998.*

Santa Clara Valley Water District. (2010). *Urban Water Management Plan*. <http://www.valleywater.org/EkContent.aspx?id=3433&terms=groundwater+water+quality+objectives> (Last accessed: January, 2012)

Santa Clara Valley Urban Runoff Prevention Program. *New Development Reports and Work Products.* <http://www.scvurppp-w2k.com/nd_wp.shtml#hmp> (Last accessed: January, 2012).

Santa Clara Valley Urban Runoff Pollution Prevention Program. (June 2006). *C.3. Stormwater Handbook.* <http://www.eoainc.com/c3_handbook_final_may2004/pdfs/Chapter-5_C3_Handbook_all.pdf> (Last accessed: August 31, 2011).

State Water Resources Control Board. (2010) *Integrated Report (Clean Water Act 303(d) List/305(b) Report)* (Last Accessed: December 9, 2011)

State Water Resources Control Board, NPDES (Nov 2010) *Construction General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ, NPDES No. CAS000002)*, Adopted September 2009; Updated November 2010.

State Water Resources Control Board. (2009). *Municipal Regional Stormwater NPDES Permit (Order R2-2009-0074 NPDES Permit No. CAS612008)*, Adopted October 14, 2009. <http://www.swrcb.ca.gov/rwqcb2/board_decisions/adopted_orders/2009/R2-2009-0074.pdf> (Last accessed: August 31, 2011)

State Water Resources Control Board. (2004). General Waste Discharge Requirements *(Water Quality Order -2004-0004-DWQ)*

URS Corporation. (March 2013). *Biological Assessment: US 101 Express Lanes Project.*

URS Corporation. (March 2013). *Draft Jurisdictional Delineation: US 101 Express Lanes Project.*

URS Corporation. (November 2012). *Initial Site Assessment Report: US 101 Express Lanes Project.*

URS Corporation. (March 2013*). Natural Environment Study: US 101 Express Lanes Project.*

URS Corporation. (2012). *Preliminary Environmental Analysis Report, US 101 Express Lanes Project, Santa Clara County, California.*

URS Corporation. (March, 2013). *Preliminary Geotechnical Report: US 101 Express Lanes Project.*

Appendix A Water Quality Objectives

Appendix A.1 Water Quality Objectives for SFBRWQCB

3.2 OBJECTIVES FOR OCEAN WATERS

The provisions of the State Board's "Water Quality Control Plan for Ocean Waters of California" (Ocean Plan) and "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" (Thermal Plan) and any revision to them will apply to ocean waters. These plans describe objectives and effluent limitations for ocean waters.

3.3 OBJECTIVES FOR SURFACE WATERS

The following objectives apply to all surface waters within the region, except the Pacific Ocean.

3.3.1 BACTERIA

Table 3-1 provides a summary of the bacterial water quality objectives and identifies the sources of those objectives. Table 3-2 summarizes U.S. EPA's water quality criteria for water contact recreation based on the frequency of use a particular area receives. These criteria will be used to differentiate between pollution sources or to supplement objectives for water contact recreation.

3.3.2 BIOACCUMULATION

Many pollutants can accumulate on particles, in sediment, or bioaccumulate in fish and other aquatic organisms. Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered.

3.3.3 BIOSTIMULATORY SUBSTANCES

Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses. Changes in chlorophyll a and associated phytoplankton communities follow complex dynamics that are sometimes associated with a discharge of biostimulatory substances. Irregular and extreme levels of chlorophyll a or phytoplankton blooms may indicate exceedance of this objective and require investigation.

3.3.4 COLOR

Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.

3.3.5 DISSOLVED OXYGEN

For all tidal waters, the following objectives shall apply:

In the Bay:

Downstream of Carquinez Bridge	5.0 mg/l minimum
Upstream of Carquinez Bridge	7.0 mg/l minimum

For nontidal waters, the following objectives shall apply:

Waters designated as:

Cold water habitat	7.0 mg/l minimum
Warm water habitat	5.0 mg/l minimum

The median dissolved oxygen concentration for any three consecutive months shall not be less than 80 percent of the dissolved oxygen content at saturation.

Dissolved oxygen is a general index of the state of the health of receiving waters. Although minimum concentrations of 5 mg/l and 7 mg/l are frequently used as objectives to protect fish life, higher concentrations are generally desirable to protect sensitive aquatic forms. In areas unaffected by waste discharges, a level of about 85 percent of oxygen saturation exists. A three-month median objective of 80 percent of oxygen saturation allows for some degradation from this level, but still requires a consistently high oxygen content in the receiving water.

3.3.6 FLOATING MATERIAL

Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.

3.3.7 OIL AND GREASE

Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.

3.3.8 POPULATION AND COMMUNITY ECOLOGY

All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce significant alterations in population or community ecology or receiving water biota. In addition, the health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors.

3.3.9 pH

The pH shall not be depressed below 6.5 nor raised above 8.5. This encompasses the pH range usually found in waters within the basin. Controllable water quality factors shall not cause changes greater than 0.5 units in normal ambient pH levels.

3.3.10 RADIOACTIVITY

Radionuclides shall not be present in concentrations that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life. Waters designated for use as domestic or municipal supply shall not contain concentrations of radionuclides in excess of the limits specified in Table 4 of Section 64443 (Radioactivity) of Title 22 of the California Code of Regulations (CCR), which is incorporated by reference into this Plan. This incorporation is prospective, including future changes to the incorporated provisions as the changes take effect (see Table 3-5).

3.3.11 SALINITY

Controllable water quality factors shall not increase the total dissolved solids or salinity of waters of the state so as to adversely affect beneficial uses, particularly fish migration and estuarine habitat.

3.3.12 SEDIMENT

The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Controllable water quality factors shall not cause a detrimental increase in the concentrations of toxic pollutants in sediments or aquatic life.

3.3.13 SETTLEABLE MATERIAL

Waters shall not contain substances in concentrations that result in the deposition of material that cause nuisance or adversely affect beneficial uses.

3.3.14 SUSPENDED MATERIAL

Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

3.3.15 SULFIDE

All water shall be free from dissolved sulfide concentrations above natural background levels. Sulfide occurs in Bay muds as a result of bacterial action on organic matter in an anaerobic environment.

Concentrations of only a few hundredths of a milligram per liter can cause a noticeable odor or be toxic to aquatic life. Violation of the sulfide objective will reflect violation of dissolved oxygen objectives as sulfides cannot exist to a significant degree in an oxygenated environment.

3.3.16 TASTES AND ODORS

Waters shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, that cause nuisance, or that adversely affect beneficial uses.

3.3.17 TEMPERATURE

Temperature objectives for enclosed bays and estuaries are as specified in the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays of California," including any revisions to the plan.

In addition, the following temperature objectives apply to surface waters:

- The natural receiving water temperature of inland surface waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.
- The temperature of any cold or warm freshwater habitat shall not be increased by more than 5°F (2.8°C) above natural receiving water temperature

3.3.18 TOXICITY

All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms. Detrimental responses include, but are not limited to, decreased growth rate and decreased reproductive success of resident or indicator species. There shall be no acute toxicity in ambient waters. Acute toxicity is defined as a median of less than 90 percent survival, or less than 70 percent survival, 10 percent of the time, of test organisms in a 96-hour static or continuous flow test.

There shall be no chronic toxicity in ambient waters. Chronic toxicity is a detrimental biological effect on growth rate, reproduction, fertilization success, larval development, population abundance, community composition, or any other relevant measure of the health of an organism, population, or community.

Attainment of this objective will be determined by analyses of indicator organisms, species diversity, population density, growth anomalies, or toxicity tests (including those described in Chapter 4), or other methods selected by the Water Board. The Water Board will also consider other relevant information and numeric criteria and guidelines for toxic substances developed by other agencies as appropriate.

The health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors.

3.3.19 TURBIDITY

Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases from normal background light penetration or turbidity relatable to waste discharge shall not be greater than 10 percent in areas where natural turbidity is greater than 50 NTU.

3.3.20 UN-IONIZED AMMONIA

The discharge of wastes shall not cause receiving waters to contain concentrations of un-ionized ammonia in excess of the following limits (in mg/l as N):

Annual Median	0.025
Maximum, Central Bay (as depicted in Figure 2-5) and upstream	0.16
Maximum, Lower Bay (as depicted in Figures 2-6 and 2-7):	0.4

The intent of this objective is to protect against the chronic toxic effects of ammonia in the receiving waters. An ammonia objective is needed for the following reasons:

- Ammonia (specifically un-ionized ammonia) is a demonstrated toxicant. Ammonia is generally accepted as one of the principle toxicants in municipal waste discharges. Some industries also discharge significant quantities of ammonia.
- Exceptions to the effluent toxicity limitations in Chapter 4 of the Plan allow for the discharge of ammonia in toxic amounts. In most instances, ammonia will be diluted or degraded to a nontoxic state fairly rapidly. However, this does not occur in all cases, the South Bay being a notable example. The ammonia limit is recommended in order to preclude any build up of ammonia in the receiving water.
- A more stringent maximum objective is desirable for the northern reach of the Bay for the protection of the migratory corridor running through Central Bay, San Pablo Bay, and upstream reaches.

3.3.21 OBJECTIVES FOR SPECIFIC CHEMICAL CONSTITUENTS

Surface waters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use. Water quality objectives for selected toxic pollutants for surface waters are given in Tables 3-3, 3-3A, 3-3B, 3-3C, 3-4 and 3-4A.

The Water Board intends to work towards the derivation of site-specific objectives for the Bay-Delta estuarine system. Site-specific objectives to be considered by the Water Board shall be developed in accordance with the provisions of the federal Clean Water Act, the State Water Code, State Board water quality control plans, and this Plan. These site-specific objectives will take into consideration factors such as all available scientific information and monitoring data and the latest U.S. EPA guidance, and local environmental conditions and impacts caused by bioaccumulation. The objectives in Tables 3-3 and 3-4 apply throughout the region except as otherwise indicated in the tables or when site-specific objectives for the pollutant parameter have been adopted. Site-specific objectives have been adopted for copper in segments of San Francisco Bay (see Figure 7.2-1-01), for nickel in South San Francisco Bay (Table 3-3A), and for cyanide in all

San Francisco Bay segments (Table 3-3C). Objectives for mercury that apply to San Francisco Bay are listed in Table 3-3B. Objectives for mercury that apply to Walker Creek, Soulajule Reservoir, and their tributaries, and to waters of the Guadalupe River watershed are listed in Table 3-4A.

South San Francisco Bay south of the Dumbarton Bridge is a unique, water-quality-limited, hydrodynamic and biological environment that merits continued special attention by the Water Board. Controlling urban and upland runoff sources is critical to the success of maintaining water quality in this portion of the Bay. Site-specific water quality objectives have been adopted for dissolved copper and nickel in this Bay segment. Site-specific objectives may be appropriate for other pollutants of concern, but this determination will be made on a case-by-case basis, and after it has been demonstrated that all other reasonable treatment, source control and pollution prevention measures have been exhausted. The Water Board will determine whether revised water quality objectives and/or effluent limitations are appropriate based on sound technical information and scientific studies, stakeholder input, and the need for flexibility to address priority problems in the watershed.

3.3.22 CONSTITUENTS OF CONCERN FOR MUNICIPAL AND AGRICULTURAL WATER SUPPLIES

At a minimum, surface waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of constituents in excess of the maximum (MCLs) or secondary maximum contaminant levels (SMCLs) specified in the following provisions of Title 22, which are incorporated by reference into this plan: Table 64431-A (Inorganic Chemicals) of Section 64431, and Table 64433.2-A (Fluoride) of Section 64433.2, Table 64444-A (Organic Chemicals) of Section 64444, and Table 64449-A (SMCLs-Consumer Acceptance Limits) and 64449-B (SMCLs-Ranges) of Section 64449. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. Table 3-5 contains water quality objectives for municipal supply, including the MCLs contained in various sections of Title 22 as of the adoption of this plan.

At a minimum, surface waters designated for use as agricultural supply (AGR) shall not contain concentrations of constituents in excess of the levels specified in Table 3-6.

3.4 OBJECTIVES FOR GROUNDWATER

Groundwater objectives consist primarily of narrative objectives combined with a limited number of numerical objectives. Additionally, the Water Board will establish basin- and/or site-specific numerical groundwater objectives as necessary. For example, the Water Board has groundwater basin-specific objectives for the Alameda Creek watershed above Niles to include the Livermore-Amador Valley as shown in Table 3-7.

The maintenance of existing high quality of groundwater (i.e., "background") is the primary groundwater objective.

In addition, at a minimum, groundwater shall not contain concentrations of bacteria, chemical constituents, radioactivity, or substances producing taste and odor in excess of the objectives described below unless naturally occurring background concentrations are greater. Under existing law, the Water Board regulates waste discharges to land that could affect water quality, including both groundwater and surface water quality. Waste discharges that reach groundwater are regulated to protect both groundwater and any surface water in continuity with groundwater. Waste discharges that affect groundwater that is in continuity with surface water cannot cause violations of any applicable surface water standards.

3.4.1 BACTERIA

In groundwater with a beneficial use of municipal and domestic supply, the median of the most probable number of coliform organisms over any seven-day period shall be less than 1.1 most probable number per 100 milliliters (MPN/100 mL) (based on multiple tube fermentation technique; equivalent test results based on other analytical techniques as specified in the National Primary Drinking Water Regulation, 40 CFR, Part 141.21 (f), revised June 10, 1992, are acceptable).

3.4.2 ORGANIC AND INORGANIC CHEMICAL CONSTITUENTS

All groundwater shall be maintained free of organic and inorganic chemical constituents in concentrations that adversely affect beneficial uses. To evaluate compliance with water quality objectives, the Water Board will consider all relevant and scientifically valid evidence, including relevant and scientifically valid numerical criteria and guidelines developed and/or published by other agencies and organizations (e.g., U.S. Environmental Protection Agency (U.S. EPA), the State Water Board, California Department of Health Services (DHS), U.S. Food and Drug Administration, National Academy of Sciences, California Environmental Protection Agency's (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA), U.S. Agency for Toxic Substances and Disease Registry, Cal/EPA Department of Toxic Substances Control (DTSC), and other appropriate organizations.)

At a minimum, groundwater designated for use as domestic or municipal supply (MUN) shall not contain concentrations of constituents in excess of the maximum (MCLs) or secondary maximum contaminant levels (SMCLs) specified in the following provisions of Title 22, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) of Section 64431, Table 64433.2-A (Fluoride) of Section 64433.2, and Table 64444-A (Organic Chemicals) of Section 64444. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

Groundwater with a beneficial use of agricultural supply shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use. In determining compliance with this objective, the Water Board will consider as evidence relevant and scientifically valid water quality goals from sources such as the Food and Agricultural Organizations of the United Nations; University of California Cooperative Extension, Committee of Experts; and McKee and Wolf's "Water Quality Criteria," as well as other relevant and scientifically valid evidence. At a minimum, groundwater designated for use as agricultural supply (AGR) shall not contain concentrations of constituents in excess of the levels specified in Table 3-6.

Groundwater with a beneficial use of freshwater replenishment shall not contain concentrations of chemicals in amounts that will adversely affect the beneficial use of the receiving surface water.

Groundwater with a beneficial use of industrial service supply or industrial process supply shall not contain pollutant levels that impair current or potential industrial uses.

3.4.3 RADIOACTIVITY

At a minimum, groundwater designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the MCLs specified in Table 4 (Radioactivity) of Section 64443 of Title 22, which is incorporated by reference into this plan. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

3.4.4 TASTE AND ODOR

Groundwater designated for use as domestic or municipal supply (MUN) shall not contain taste- or odor-producing substances in concentrations that cause a nuisance or adversely affect beneficial uses. At a minimum, groundwater designated for use as domestic or municipal supply shall not contain concentrations in excess of the SMCLs specified in Tables 64449-A (Secondary MCLs-Consumer Acceptance Limits) and 64449-B (Secondary MCLs-Ranges) of Section 64449 of Title 22, which is incorporated by reference into this plan. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

3.5 OBJECTIVES FOR THE DELTA

The objectives contained in the State Water Board's 1995 "Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary" and any revisions thereto shall apply to the waters of the Sacramento-San Joaquin Delta and adjacent waters as specified in that plan.

3.6 OBJECTIVES FOR ALAMEDA CREEK WATERSHED

The water quality objectives contained in Table 3-7 apply to the surface and groundwaters of the Alameda Creek watershed above Niles.

Wastewater discharges that cause the surface water limits in Table 3-7 to be exceeded may be allowed if they are part of an overall wastewater resource operational program developed by those agencies affected and approved by the Water Board.

TABLES

Appendix A.2 Water Quality Objectives for CCRWQCB

presents a hazard to human, plant, animal, or aquatic life.

II.A.2. OBJECTIVES FOR ALL INLAND SURFACE WATERS, ENCLOSED BAYS, AND ESTUARIES

II.A.2.a. GENERAL OBJECTIVES

The following objectives apply to all inland surface waters, enclosed bays, and estuaries of the basin:

Color

Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses. Coloration attributable to materials of waste origin shall not be greater than 15 units or 10 percent above natural background color, whichever is greater.

Tastes and Odors

Waters shall not contain taste or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, that cause nuisance, or that adversely affect beneficial uses.

Floating Material

Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.

Suspended Material

Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

Settleable Material

Waters shall not contain settleable material in concentrations that result in deposition of material that causes nuisance or adversely affects beneficial uses.

Oil and Grease

Waters shall not contain oils, greases, waxes, or other similar materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.

Biostimulatory Substances

Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

Sediment

The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Turbidity

Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses.

Increase in turbidity attributable to controllable water quality factors shall not exceed the following limits:

1. Where natural turbidity is between 0 and 50 Jackson Turbidity Units (JTU), increases shall not exceed 20 percent.

2. Where natural turbidity is between 50 and 100 JTU, increases shall not exceed 10 JTU.

3. Where natural turbidity is greater than 100 JTU, increases shall not exceed 10 percent.

Allowable zones of dilution within which higher concentrations will be tolerated will be defined for each discharge in discharge permits.

pH

For waters not mentioned by a specific beneficial use, the pH value shall not be depressed below 7.0 or raised above 8.5.

Dissolved Oxygen

For waters not mentioned by a specific beneficial use, dissolved oxygen concentration shall not be reduced below 5.0 mg/l at any time. Median values should not fall below 85 percent saturation as a result of controllable water quality conditions.

Temperature

Temperature objectives for Enclosed Bays and Estuaries are as specified in the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" including any revisions thereto. A copy of this plan is included in the Appendix.

Natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.

Toxicity

All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in, human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, toxicity bioassays of appropriate duration, or other appropriate methods as specified by the Regional Board.

Survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality conditions, shall not be less than that for the same water body in areas unaffected by the waste discharge or, when necessary, for other control water that is consistent with the requirements for "experimental water" as described in Standard Methods for the Examination of Water and Wastewater, latest edition. As a minimum, compliance with this objective shall be evaluated with a 96-hour bioassay.

In addition, effluent limits based upon acute bioassays of effluents will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data become available, and source control of toxic substances is encouraged.

The discharge of wastes shall not cause concentrations of unionized ammonia (NH3) to exceed 0.025 mg/l (as N) in receiving waters.

Pesticides

No individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life.

For waters where existing concentrations are presently nondetectable or where beneficial uses would be impaired by concentrations in excess of nondetectable levels, total identifiable chlorinated hydrocarbon pesticides shall not be present at concentrations detectable within the accuracy of analytical methods prescribed in Standard Methods for the Examination of Water and Wastewater, latest edition, or other equivalent methods approved by the Executive Officer.

Chemical Constituents

Where wastewater effluents are returned to land for irrigation uses, regulatory controls shall be consistent with Title 22 of the California Code of Regulations and other relevant local controls.

Other Organics

Waters shall not contain organic substances in concentrations greater than the following:

Methylene Blue Activated Substances	0.2 mg/l
Phenols	0.1 mg/l
PCB's	0.3 μg/l
Phthalate Esters	0.002 μg/l

Radioactivity

Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life; or result in the accumulation of radionuclides in the food web to an extent which presents a hazard to human, plant, animal, or aquatic life.

MUNICIPAL AND DOMESTIC SUPPLY (MUN)

pH

The pH value shall neither be depressed below 6.5 nor raised above 8.3.

Organic Chemicals

All inland surface waters, enclosed bays, and estuaries shall not contain concentrations of organic chemicals in excess of the limiting concentrations set forth in California Code of Regulations, Title 22, Chapter 15, Article 5.5, Section 64444.5, Table 5 and listed in Table 3-1.

Chemical Constituents

Waters shall not contain concentrations of chemical constituents in excess of the limits specified in California Code of Regulations, Title 22, Article 4, Chapter 15, Section 64435, Tables 2 and 3 as listed in Table 3-2.

Phenol

Waters shall not contain phenol concentrations in excess of 1.0 μg/l.

Radioactivity

Waters shall not contain concentrations of radionuclides in excess of the limits specified in California Code of Regulations, Title 22, Chapter 15, Article 5, Sections 64441 and 64443, Table 4.

AGRICULTURAL SUPPLY (AGR)

pH

The pH value shall neither be depressed below 6.5 nor raised above 8.3.

Dissolved Oxygen

Dissolved oxygen concentration shall not be reduced below 2.0 mg/l at any time.

Chemical Constituents

Waters shall not contain concentrations of chemical constituents in amounts which adversely affect the agricultural beneficial use. Interpretation of adverse effect shall be as derived from the University of California Agricultural Extension Service guidelines provided in Table 3-3.

In addition, waters used for irrigation and livestock watering shall not exceed concentrations for those chemicals listed in Table 3-4. Salt concentrations for irrigation waters shall be controlled through implementation of the anti-degradation policy to the effect that mineral constituents of currently or potentially usable waters shall not be increased. It is emphasized that no controllable water quality factor shall degrade the quality of any ground water resource or adversely affect long-term soil productivity.

Where wastewater effluents are returned to land for irrigation uses, regulatory controls shall be consistent with Title 22 of the California Code of Regulations and with relevant controls for local irrigation sources.

WATER CONTACT RECREATION (REC-1)

pH

The pH value shall neither be depressed below 6.5 nor raised above 8.3.

Table 3-1. Organic Concentrations Not to be Exceeded in Domestic or Municipal Supply

Constituent		Maximum Contaminant Level (MCL), mg/l
(a)	Chlorinated Hydrocarbons	
	Endrin	0.0002
	Lindane	0.004
	Methoxychlor	0.1
	Toxaphene	0.005
(b)	Chlorophenoxys	
	2,4-D	0.1
	2,4,5-TP Silvex	0.01
(c)	Synthetics	
	Atrazine	0.003
	Bentazon	0.018
	Benzene	0.001
	Carbon Tetrachloride	0.0005
	Carbofuran	0.018
	Chlordane	0.0001
	1,2-Dibromo-3-chloropropane	0.0002
	1,4-Dichlorobenzene	0.005
	1,1-Dichloroethane	0.005
	1,2-Dichloroethane	0.0005
	cis-1,2-Dichloroethylene	0.006
	trans-1,2-Dichloroethylene	0.01
	1,1-Dichloroethylene	0.006
	1,2-Dichloropropane	0.005
	1,3-Dichloropropene	0.0005
	Di(2-ethylhexyl) phthalate	0.004
	Ethylbenzene	0.680
	Ethylene Dibromide	0.00002
	Glyphosate	0.7
	Heptachlor	0.00001
	Heptachlor epoxide	0.00001
	Molinate	0.02
	Monochlorobenzene	0.030
	Simazine	0.010
	1,1,2,2-Tetrachloroethane	0.001
	Tetrachloroethylene	0.005
	Thiobencarb	0.07
	1,1,1-Trichloroethane	0.200
	1,1,2-Trichloroethane	0.032
	Trichloroethylene	0.005
	Trichlorofluromethane	0.15
	1,1,2-Trichloro-1,2,2-Trifluoroethane	1.2
	Vinyl Chloride	0.0005
	*Xylenes	1.750

* MCL is for either a single isomer or the sum of the isomers.

Table 3-2. Inorganic and Fluoride Concentrations Not to be Exceeded in Domestic or Municipal Supply

	Limiting Concentration ,mg/l			
Constituent	Lower	Optimum	Upper	Maximum Contaminant Level
Temperature °F*	Fluoride			
53.7° and below	0.9	1.2	1.7	2.4
53.8° to 58.3°	0.8	1.1	1.5	2.2
58.4° to 63.8°	0.8	1.0	1.3	2.0
63.9° to 70.6°	0.7	0.9	1.2	1.8
70.7° to 79.2°	0.7	0.8	1.0	1.6
79.3° to 90.5°	0.6	0.7	0.8	1.4
Inorganic Chemicals				Maximum Contaminant Level
Aluminum				1
Arsenic				0.05
Barium				1
Cadmium				0.010
Chromium				0.05
Lead				0.05
Mercury				0.002
Nitrate (as NO3)				45
Selenium				0.01
Silver				0.05

*Annual Average of Maximum Daily Air Temperature, °F based on temperature data obtained for a minimum of five years.

Table 3-3. Guidelines for Interpretation of Quality of Water for Irrigation[a]

Problem and Related Constituent	No Problem	Water Quality Guidelines Increasing Problems	Severe
Salinity[b]			
EC of irrigation water, mmho/cm	<0.75	0.75 - 3.0	>3.0
Permeability			
EC of irrigation water, mmho/cm	>0.5	<0.5	<0.2
SAR, adjusted[c]	<6.0	6.0 - 9.0	>9.0
Specific ion toxicity from root absorption [d]			
Sodium (evaluate by adjusted SAR)	<3	3.0 - 9.0	>9.0
Chloride			
me/l	<4	4.0 - 10	>10
mg/l	<142	142 - 355	>355
Boron, mg/l	<0.5	0.5 - 2.0	2.0 - 10.0
Specific ion toxicity from foliar absorption[e](sprinklers)			
Sodium			
me/l	<3.0	>3.0	--
mg/l	<69	>69	--
Chloride			
me/l	<3.0	>3.0	--
mg/l	<106	>106	--
Miscellaneous[f]			
NH4 - N, mg/l for sensitive crops	<5	5 - 30	>30
NO3 - N, mg/l for sensitive crops	<5	5 - 30	>30
HCO3 (only with overhead sprinklers)			
me/l	<1.5	1.5 - 8.5	>8.5
mg/l	<90	90 - 520	>520
pH	Normal range	6.5 - 8.4	--

a Interpretations are based on possible effects of constituents on crops and/or soils. Guidelines are flexible and should be modified when warranted by local experience or special conditions of crop, soil, and method of irrigation.

b Assumes water for crop plus needed water for leaching requirement (LR) will be applied. Crops vary in tolerance to salinity. Refer to tables for crop tolerance and LR. The mmho/cm x 640 = approximate total dissolved solids (TDS) in mg/l or ppm; mmho x 1,000 = micromhos.

c Adjusted SAR (sodium adsorption ratio) is calculated from a modified equation developed by U.S. Salinity Laboratory to include added effects of precipitation and dissolution of calcium in soils and related to CO_3 + HCO_3 concentrations.

To evaluate sodium (permeability) hazard: Adjusted SAR = $Na/[1/2\ (Ca + Mg)]^{1/2}[1 + (8.4 - pHc)]$.
Refer to Appendix for calculation assistance.

SAR can be reduced if necessary by adding gypsum. Amount of gypsum required (GR) to reduce a hazardous SAR to any desired SAR (SAR desired) can be calculated as follows:

$$GR = \left[\frac{2(Na)^2}{SAR^2\ desired} - (Ca + Mg) \right] 234$$

Note: Na and Ca + Mg should be in me/l. GR will be in lbs. of 100 percent gypsum per acre foot of applied water.

d Most tree crops and woody ornamentals are sensitive to sodium and chloride (use values shown). Most annual crops are not sensitive (use salinity tolerance tables). For boron sensitivity, refer to boron tolerance tables.

e Leaf areas wet by sprinklers (rotating heads) may show a leaf burn due to sodium or chloride absorption under low humidity/high evaporation conditions. (Evaporation increases ion concentration in water films on leaves between rotations of sprinkler heads.)

f Excess N may affect production or quality of certain crops; e.g., sugar beets, citrus, avocados, apricots, etc.
(1 mg/l NO_3 - N = 2.72 lbs. N/acre foot of applied water.) HCO_3 with overhead sprinkler irrigation may cause a white carbonate deposit to form on fruit and leaves.

Table 3-4. Water Quality Objectives for Agricultural Water Use

ELEMENT	Maximum Concentration (mg/l)[a] Irrigation supply[b]	Livestock watering
Aluminum	5.0	5.0
Arsenic	0.1	0.2
Beryllium	0.1	--
Boron	0.75	5.0
Cadmium	0.01	0.05
Chromium	0.10	1.0
Cobalt	0.05	1.0
Copper	0.2	0.5
Fluoride	1.0	2.0
Iron	5.0	--
Lead	5.0	0.1[c]
Lithium	2.5[d]	--
Manganese	0.2	--
Mercury	--	0.01
Molybdenum	0.01	0.5
Nickel	0.2	--
Nitrate + Nitrite	--	100
Nitrite	--	10
Selenium	0.02	0.05
Vanadium	0.1	0.10
Zinc	2.0	25

a. Values based primarily on "Water Quality Criteria 1972" National Academy of Sciences-National Academy of Engineers, Environmental Study Board, ad hoc Committee on Water Quality Criteria furnished as recommended guidelines by University of California Agriculture Extension Service, January 7, 1974; maximum values are to be considered as 90 percentile values not to be exceeded.

b. Values provided will normally not adversely affect plants or soils; no data available for mercury, silver, tin, titanium, and tungsten.

c. Lead is accumulative and problems may begin at threshold value (0.05 mg/l).

d. Recommended maximum concentration for irrigation citrus is 0.075 mg/l.

Bacteria

Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200/100 ml, nor shall more than ten percent of total samples during any 30-day period exceed 400/100 ml.

NON-CONTACT WATER RECREATION (REC-2)

pH

The pH value shall neither be depressed below 6.5 nor raised above 8.3.

Bacteria

Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 2000/100 ml, nor shall more than ten percent of samples collected during any 30-day period exceed 4000/100 ml.

COLD FRESHWATER HABITAT (COLD)

pH

The pH value shall not be depressed below 7.0 or raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters.

Dissolved Oxygen

The dissolved oxygen concentration shall not be reduced below 7.0 mg/l at any time.

Temperature

At no time or place shall the temperature be increased by more than 5oF above natural receiving water temperature.

Chemical Constituents

Waters shall not contain concentrations of chemical constituents known to be deleterious to fish or wildlife in excess of the limits listed in Table 3-5.

WARM FRESHWATER HABITAT (WARM)

pH

The pH value shall not be depressed below 7.0 or raised above 8.5.

Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters.

Dissolved Oxygen

The dissolved oxygen concentration shall not be reduced below 5.0 mg/l at any time.

Temperature

At no time or place shall the temperature of any water be increased by more than 5oF above natural receiving temperature.

Chemical Constituents

Waters shall not contain concentrations of chemical constituents known to be deleterious to fish or wildlife in excess of the limits listed in Table 3-5.

FISH SPAWNING (SPWN)

Cadmium

Cadmium shall not exceed .003 mg/l in hard water or .0004 mg/l in soft water at any time. (Hard water is defined as water exceeding 100 mg/l CaCO3.)

Dissolved Oxygen

The dissolved oxygen concentration shall not be reduced below 7.0 mg/l at any time.

Table 3-5. Toxic Metal Concentrations not to be Exceeded in Aquatic Life Habitats, mg/l[a,b]

	Freshwater (COLD, WARM)	
METAL	HARD (> 100 mg/l CaCO3)	SOFT (< 100 mg/l CaCO3)
Cadmium[c]	.03	.004
Chromium	.05	.05
Copper	.03	.01
Lead	.03	.03
Mercury[d]	.0002	.0002
Nickel[e]	.4	.1
Zinc	.2	.004

a. Based on limiting values recommended in the National Academy of Sciences-National Academy of Engineers "Water Quality Criteria 1972." Values are 90 percentile values except as noted in qualifying note "d."

b. Revision of Table 3-5 is currently in progress by the Regional Board.

c. Lower cadmium values not to be exceeded for crustaceans and waters designated SPWN are 0.003 mg/l in hard water and 0.0004 mg/l in soft water.

d. Total mercury values should not exceed 0.05 μg/l as an average value; maximum acceptable concentration of total mercury in any aquatic organism is a total B.O.D. burden of 0.5 μg/l wet weight.

e. Value cited as objective pertains to nickel salts (not pure metallic nickel).

MARINE HABITAT (MAR)

pH

The pH value shall not be depressed below 7.0 or raised above 8.5.

Changes in normal ambient pH levels shall not exceed 0.2 units.

Dissolved Oxygen

The dissolved oxygen concentration shall not be reduced below 7.0 mg/l at any time.

Chemical Constituents

Waters shall not contain concentrations of chemical constituents known to be deleterious to fish or wildlife in excess of limits listed in Table 3-6.

Table 3-6. Toxic Metal Concentrations Not to be Exceeded in Marine Habitats, mg/l[a]

METAL	MARINE (MAR)
Cadmium	.0002
Chromium	.05
Copper	.01
Lead	.01
Mercury[c]	.0001
Nickel[d]	.002
Zinc	.02

a. Based on limiting values recommended in the National Academy of Sciences-National Academy of Engineers "Water Quality Criteria 1972." Values are 90 percentile values except as noted in qualifying note "c."
b. Revision of Table 3-6 is currently in progress by the Regional Board.
c. Total mercury values should not exceed 0.05 μg/l as an average value; maximum acceptable concentration of total mercury in any aquatic organism is a total B.O.D. burden of 0.05 μg/l net weight.
d. Value cited as objective pertains to nickel salts (not pure metallic nickel).

SHELLFISH HARVESTING (SHELL)

Chromium

The maximum permissible value for waters designated SHELL shall be 0.01 mg/l.

Bacteria

At all areas where shellfish may be harvested for human consumption, the median total coliform concentration throughout the water column for any 30-day period shall not exceed 70/100 ml, nor shall more than ten percent of the samples collected during any 30-day period exceed 230/100 ml for a five-tube decimal dilution test or 330/100 ml when a three-tube decimal dilution test is used.

II.A.3. WATER QUALITY OBJECTIVES FOR SPECIFIC INLAND SURFACE WATERS, ENCLOSED BAYS AND ESTUARIES

Certain water quality objectives have been established for selected surface waters; these objectives are intended to serve as a water quality baseline for evaluating water quality management in the basin. Median values, shown in Table 3-7 for surface waters, are based on available data.

It must be recognized that the median values indicated in Table 3-7 are values representing gross areas of a water body. Specific water quality objectives for a particular area may not be directly related to the objectives indicated. Therefore, application of these objectives must be based upon consideration of the surface and ground water quality naturally present; i.e., waste discharge requirements must adhere to the previously stated objectives and issuance of requirements must be tempered by consideration of beneficial uses within the immediate influence of the discharge, the existing quality of receiving waters, and water quality objectives. Consideration of beneficial uses includes: (1) a specific enumeration of all beneficial uses potentially to be affected by the waste discharge, (2) a determination of the relative importance of competing beneficial uses, and (3) impact of the discharge on existing beneficial uses. The Regional Board will make a judgment as to the priority of dominant use and minimize the impact on competing uses while not allowing the discharge to violate receiving water quality objectives.

Table 3-7. Surface Water Quality Objectives, mg/l[a]

Sub-Basin/Sub-Area	TDS	Cl	SO4	B	Na
Santa Ynez					
Cachuma Reservoir	600	20	220	0.4	50
Solvang	700	50	250	0.4	60
Lompoc	1000	100	350	0.4	100
Santa Maria					
Cuyama River (Near Garey)	900	50	400	0.3	70
Sisquoc River (Near Garey)	600	20	250	0.2	50
Estero Bay					
Santa Rosa Creek	500	50	80	0.2	50
Chorro Creek	500	50	50	0.2	50
San Luis Obispo Creek	650	100	100	0.2	50
Arroyo Grande Creek	800	50	200	0.2	50
Salinas River					
Salinas River					
Above Bradley	250	20	100	0.2	20
Above Spreckles	600	80	125	0.2	70
Gabilan Tributary	300	50	50	0.2	50
Diablo Tributary	1200	80	700	0.5	150
Nacimiento River	200	20	50	0.2	20
San Antonio River	250	20	80	0.2	20
Carmel River	200	20	50	0.2	20
Monterey Coastal					
Big Sur River	200	20	20	0.2	20
Pajaro River					
at Chittenden	1000	250	250	1.0	200
San Benito River	1400	200	350	1.0	250
Llagas Creek	200	10	20	0.2	20
Big Basin					
Boulder Creek	150	10	10	0.2	20
Zayante Creek	500	50	100	0.2	40
San Lorenzo River					
Above Bear Creek	400	60	80	0.2	50
At Tait Street Check Dam	250	30	60	0.2	25

a Objectives shown are annual mean values. Objectives are based on preservation of existing quality or water quality enhancement believed attainable following control of point sources.

As part of the State's continuing planning process, data will be collected and numerical water quality objectives will be developed for those mineral and nutrient constituents where sufficient information is presently not available for the establishment of such objectives.

II.A.4. OBJECTIVES FOR GROUND WATER

II.A.4.a. GENERAL OBJECTIVES

The following objectives apply to all ground waters of the basin.

Tastes and Odors

Ground waters shall not contain taste or odor producing substances in concentrations that adversely affect beneficial uses.

Radioactivity

Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life; or result in the accumulation of radionuclides in the food web to an extent which presents a hazard to human, plant, animal, or aquatic life.

MUNICIPAL AND DOMESTIC SUPPLY (MUN)

Bacteria

The median concentration of coliform organisms over any seven-day period shall be less than 2.2/100 ml.

Organic Chemicals

Ground waters shall not contain concentrations of organic chemicals in excess of the limiting concentrations set forth in California Code of Regulations, Title 22, Chapter 15, Article 5.5, Section 64444.5, Table 5 and listed in Table 3-1.

Chemical Constituents

Ground waters shall not contain concentrations of chemical constituents in excess of the limits specified in California Code of Regulations, Title 22, Chapter 15, Article 4, Section 64435, Tables 2 and 3.

Radioactivity

Ground waters shall not contain concentrations of radionuclides in excess of the limits specified in California Code of Regulations, Title 22, Chapter 15, Article 5, Section 64443, Table 4.

AGRICULTURAL SUPPLY (AGR)

Ground waters shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use. Interpretation of adverse effect shall be as derived from the University of California Agricultural Extension Service guidelines provided in Table 3-3.

In addition, water used for irrigation and livestock watering shall not exceed the concentrations for those chemicals listed in Table 3-4. No controllable water quality factor shall degrade the quality of any ground water resource or adversely affect long-term soil productivity. The salinity control aspects of ground water management will account for effects from all sources.

II.A.5. OBJECTIVES FOR SPECIFIC GROUND WATERS

Certain water quality objectives have been established for selected ground waters; these objectives are intended to serve as a water quality baseline for evaluating water quality management in the basin. The median values for ground waters are shown in Table 3-8.

The restrictions specified for Table 3-7 are applicable to the values indicated in Table 3-8; i.e., the values are at best representative of gross areas only. Ground waters in the Upper Valley of the Salinas River Sub-basin have average Total Dissolved Solids (TDS) concentrations that range from 300 mg/l to over 3000 mg/l. Therefore, application of these objectives must be consistent with the objectives previously stated in this chapter and synchronously reflect the actual ground water quality naturally present. The Regional Board must afford full consideration to: (1) present and probable future beneficial uses affected by the waste discharge; (2) competing beneficial uses; (3) degree of impact on existing beneficial uses; (4) receiving water quality; and (5) water quality objectives, before adjudging priority of dominant use and promulgating waste discharge requirements.

As part of the State's continuing planning process, data will be collected and numerical water quality objectives will be developed for those mineral constituents where sufficient information is presently not available for the establishment of such objectives.

Table 3-8. Median Ground Water Objectives, mg/l[a]

Sub-basin/Sub-Area	TDS	Cl	SO_4	B	Na	N[b]
South Coast						
Goleta	1000	150	250	0.2	150	5
Santa Barbara	700	50	150	0.2	100	5
Carpinteria	700	100	150	0.2	100	7
Santa Ynez						
Santa Ynez	600	50	10	0.5	20	1
Santa Rita	1500	150	700	0.5	100	1
Lompoc Plain[f]	1250	250	500	0.5	250	2
Lompoc Upland[f]	600	150	100	0.5	100	2
Lompoc Terrace[f]	750	210	100	0.3	130	1
San Antonio Creek	600	150	150	0.2	100	5
Santa Maria[c]						
Upper Guadalupe[f]	1000[d]	165	500[d]	0.5	230	1.4[e]
Lower Guadalupe[f]	1000[d]	85	500[d]	0.2	90	2.0[e]
Lower Nipomo Mesa[f]	710	95	250	0.15	90	5.7[e]
Orcutt[f]	740	65	300	0.1	65	2.3[e]
Santa Maria[f]	1000[d]	90	510	0.2	105	8.0[e]
Cuyama Valley	1500	80	--	0.4	--	5
Soda Lake	[e]	[e]	[e]	[e]	[e]	[e]
Estero Bay						
Santa Rosa	700	100	80	0.2	50	5
Chorro	1000	250	100	0.2	50	5
San Luis Obispo	900	200	100	0.2	50	5
Arroyo Grande	800	100	200	0.2	50	10
Salinas River						
Upper Valley[f]	600	150	150	0.5	70	5
Upper Forebay[f]	800	100	250	0.5	100	5
Lower Forebay[f]	1500	250	850	0.5	150	8
180 foot Aquifer[f]	1500	250	600	0.5	250	1
400 foot Aquifer[f]	400	50	100	0.2	50	1
Paso Robles[g]						
Central Basin[f]	400	60	45	0.3	80	3.4
San Miguel[f]	750	100	175	0.5	105	4.5
Paso Robles[f]	1050	270	200	2.0	225	2.3
Templeton[f]	730	100	120	0.3	75	2.7
Atascadero[f]	550	70	85	0.3	65	2.3
Estrella[f]	925	130	240	0.75	170	3.2
Shandon	1390	430	1025[h]	2.8	730	2.3
Pajaro River						
Hollister	1200	150	250	1.0	200	5
Tres Pinos	1000	150	250	1.0	150	5
Llagas	300	20	50	0.2	20	5
Big Basin						
Near Felton	100	20	10	0.2	10	1
Near Boulder Creek	250	30	50	0.2	20	5

a Objectives shown are median values based on data averages; objectives are based on preservation of existing quality or water quality enhancement believed attainable following control of point sources.
b Measured as Nitrogen
c Basis for objectives is in the "Water Quality Objectives for the Santa Maria Ground Water Basin Revised Staff Report, May 1985" and February 1986, Staff Report.
d These are maximum objectives in accordance with Title 22 of the Code of Regulations.
e Ground water basin currently exceeds usable mineral quality.
f Ground water basin boundary map available in appendix.
g Basis for objectives is in the report "A Study of the Paso Robles Ground Water Basin to Establish Best Management Practices and Establish Salt Objectives", Coastal Resources Institute, June 1993.
h Standard exceeds California Secondary Drinking Water Standards contained in Title 22 of the Code of Regulations. Water quality standard is based upon existing water quality. If water quality degradation occurs, the Regional Board may consider salt limits on appropriate discharges.

Appendix B Descriptions of Beneficial Uses

Appendix B.1 Descriptions of Beneficial Uses for SFBRWQCB

CHAPTER 2: BENEFICIAL USES

State policy for water quality control in California is directed toward achieving the highest water quality consistent with maximum benefit to the people of the state. Aquatic ecosystems and underground aquifers provide many different benefits to the people of the state. The beneficial uses described in detail in this chapter define the resources, services, and qualities of these aquatic systems that are the ultimate goals of protecting and achieving high water quality. The Water Board is charged with protecting all these uses from pollution and nuisance that may occur as a result of waste discharges in the region. Beneficial uses of waters of the State presented here serve as a basis for establishing water quality objectives and discharge prohibitions to attain these goals.

Beneficial use designations for any given water body do not rule out the possibility that other beneficial uses exist or have the potential to exist. Existing beneficial uses that have not been formally designated in this Basin Plan are protected whether or not they are identified. While the tables in this Chapter list a large, representative portion of the water bodies in our region, it is not practical to list each and every water body.

2.1 DEFINITIONS OF BENEFICIAL USES

The following definitions (in italic) for beneficial uses are applicable throughout the entire state. A brief description of the most important water quality requirements for each beneficial use follows each definition (in alphabetical order by abbreviation).

2.1.1 AGRICULTURAL SUPPLY (AGR)

Uses of water for farming, horticulture, or ranching, including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

The criteria discussed under municipal and domestic water supply (MUN) also effectively protect farmstead uses. To establish water quality criteria for livestock water supply, the Water Board must consider the relationship of water to the total diet, including water freely drunk, moisture content of feed, and interactions between irrigation water quality and feed quality. The University of California Cooperative Extension has developed threshold and limiting concentrations for livestock and irrigation water. Continued irrigation often leads to one or more of four types of hazards related to water quality and the nature of soils and crops. These hazards are (1) soluble salt accumulations, (2) chemical changes in the soil, (3) toxicity to crops, and (4) potential disease transmission to humans through reclaimed water use. Irrigation water classification systems, arable soil classification systems, and public health criteria related to reuse of wastewater have been developed with consideration given to these hazards.

2.1.2 AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE (ASBS)

Areas designated by the State Water Board.

These include marine life refuges, ecological reserves, and designated areas where the preservation and enhancement of natural resources requires special protection. In these areas, alteration of natural water quality is undesirable. The areas that have been designated as ASBS in this Region are Bird Rock, Point Reyes Headland Reserve and Extension, Double Point, Duxbury Reef Reserve and Extension, Farallon Islands, and James V. Fitzgerald Marine Reserve, depicted in Figure 2-1. The California Ocean Plan prohibits waste discharges into, and requires wastes to be discharged at a sufficient distance from, these areas to assure maintenance of natural water quality conditions. These areas have been designated as a subset of State Water Quality Protection Areas as per the Public Resources Code.

2.1.3 COLD FRESHWATER HABITAT (COLD)

Uses of water that support cold water ecosystems, including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Cold freshwater habitats generally support trout and may support anadromous salmon and steelhead fisheries as well. Cold water habitats are commonly well-oxygenated. Life within these waters is relatively intolerant to environmental stresses. Often, soft waters feed cold water habitats. These waters render fish more susceptible to toxic metals, such as copper, because of their lower buffering capacity.

2.1.4 COMMERCIAL AND SPORT FISHING (COMM)

Uses of water for commercial or recreational collection of fish, shellfish, or other organisms, including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

To maintain fishing, the aquatic life habitats where fish reproduce and seek their food must be protected. Habitat protection is under descriptions of other beneficial uses.

2.1.5 ESTUARINE HABITAT (EST)

Uses of water that support estuarine ecosystems, including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds), and the propagation, sustenance, and migration of estuarine organisms.

Estuarine habitat provides an essential and unique habitat that serves to acclimate anadromous fishes (e.g., salmon, striped bass) migrating into fresh or marine water conditions. The protection of estuarine habitat is contingent upon (1) the maintenance of adequate Delta outflow to provide mixing and salinity control; and (2) provisions to protect wildlife habitat associated with marshlands and the Bay periphery (i.e., prevention of fill activities). Estuarine habitat is generally associated with moderate seasonal fluctuations in dissolved oxygen, pH, and temperature and with a wide range in turbidity.

2.1.6 FRESHWATER REPLENISHMENT (FRESH)

Uses of water for natural or artificial maintenance of surface water quantity or quality.

Fresh water inputs are important for maintaining salinity balance, flow, and/or water quantity for such surface water bodies as marshes, wetlands, and lakes.

2.1.7 GROUNDWATER RECHARGE (GWR)

Uses of water for natural or artificial recharge of groundwater for purposes of future extraction, maintenance of water quality, or halting saltwater intrusion into freshwater aquifers.

The requirements for groundwater recharge operations generally reflect the future use to be made of the water stored underground. In some cases, recharge operations may be conducted to prevent seawater intrusion. In these cases, the quality of recharged waters may not directly affect quality at the wellfield being protected. Recharge operations are often limited by excessive suspended sediment or turbidity that can clog the surface of recharge pits, basins, or wells.

Under the state Antidegradation Policy, the quality of some of the waters of the state is higher than established by adopted policies. It is the intent of this policy to maintain that existing higher water quality to the maximum extent possible.

Requirements for groundwater recharge, therefore, shall impose the Best Available Technology (BAT) or Best Management Practices (BMPs) for control of the discharge as necessary to assure the highest quality consistent with maximum benefit to the people of the state. Additionally, it must be recognized that groundwater recharge occurs naturally in many areas from streams and reservoirs. This recharge may have little impact on the quality of groundwaters under normal circumstances, but it may act to transport pollutants from the recharging water body to the groundwater. Therefore, groundwater recharge must be considered when requirements are established.

2.1.8 INDUSTRIAL SERVICE SUPPLY (IND)

Uses of water for industrial activities that do not depend primarily on water quality, including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

Most industrial service supplies have essentially no water quality limitations except for gross constraints, such as freedom from unusual debris.

2.1.9 MARINE HABITAT (MAR)

Uses of water that support marine ecosystems, including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

In many cases, the protection of marine habitat will be accomplished by measures that protect wildlife habitat generally, but more stringent criteria may be necessary for waterfowl marshes and other habitats, such as those for shellfish and marine fishes. Some marine habitats, such as important intertidal zones and kelp beds, may require special protection.

2.1.10 FISH MIGRATION (MIGR)

Uses of water that support habitats necessary for migration, acclimatization between fresh water and salt water, and protection of aquatic organisms that are temporary inhabitants of waters within the region.

The water quality provisions acceptable to cold water fish generally protect anadromous fish as well. However, particular attention must be paid to maintaining zones of passage. Any barrier to migration or free movement of migratory fish is harmful. Natural tidal movement in estuaries and unimpeded river flows are necessary to sustain migratory fish and their offspring. A water quality barrier, whether thermal, physical, or chemical, can destroy the integrity of the migration route and lead to the rapid decline of dependent fisheries.

Water quality may vary through a zone of passage as a result of natural or human- induced activities. Fresh water entering estuaries may float on the surface of the denser salt water or hug one shore as a result of density differences related to water temperature, salinity, or suspended matter.

2.1.11 MUNICIPAL AND DOMESTIC SUPPLY (MUN)

Uses of water for community, military, or individual water supply systems, including, but not limited to, drinking water supply.

The principal issues involving municipal water supply quality are (1) protection of public health; (2) aesthetic acceptability of the water; and (3) the economic impacts associated with treatment- or quality-related damages.

The health aspects broadly relate to: direct disease transmission, such as the possibility of contracting typhoid fever or cholera from contaminated water; toxic effects, such as links between nitrate and methemoglobinemia (blue babies); and increased susceptibility to disease, such as links between halogenated organic compounds and cancer.

Aesthetic acceptance varies widely depending on the nature of the supply source to which people have become accustomed. However, the parameters of general concern are excessive hardness, unpleasant odor or taste, turbidity, and color. In each case, treatment can improve acceptability although its cost may not be economically justified when alternative water supply sources of suitable quality are available.

Published water quality objectives give limits for known health-related constituents and most properties affecting public acceptance. These objectives for drinking water include the U.S. Environmental Protection Agency Drinking Water Standards and the California State Department of Health Services criteria.

2.1.12 NAVIGATION (NAV)

Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.

Navigation is a designated use where water is used for shipping, travel, or other transportation by private, military, or commercial vessels.

2.1.13 INDUSTRIAL PROCESS SUPPLY (PROC)

Uses of water for industrial activities that depend primarily on water quality.

Water quality requirements differ widely for the many industrial processes in use today. So many specific industrial processes exist with differing water quality requirements that no meaningful criteria can be established generally for quality of raw water supplies. Fortunately, this is not a serious shortcoming, since current water treatment technology can create desired product waters tailored for specific uses.

2.1.14 PRESERVATION OF RARE AND ENDANGERED SPECIES (RARE)

Uses of waters that support habitats necessary for the survival and successful maintenance of plant or animal species established under state and/or federal law as rare, threatened, or endangered.

The water quality criteria to be achieved that would encourage development and protection of rare and endangered species should be the same as those for protection of fish and wildlife habitats generally. However, where rare or endangered species exist, special control requirements may be necessary to assure attainment and maintenance of particular quality criteria, which may vary slightly with the environmental needs of each particular species. Criteria for species using areas of special biological significance should likewise be derived from the general criteria for the habitat types involved, with special management diligence given where required.

2.1.15 WATER CONTACT RECREATION (REC1)

Uses of water for recreational activities involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, and uses of natural hot springs.

Water contact implies a risk of waterborne disease transmission and involves human health; accordingly, criteria required to protect this use are more stringent than those for more casual water-oriented recreation.

Excessive algal growth has reduced the value of shoreline recreation areas in some cases, particularly for swimming. Where algal growths exist in nuisance proportions, particularly bluegreen algae, all recreational water uses, including fishing, tend to suffer.

One criterion to protect the aesthetic quality of waters used for recreation from excessive algal growth is based on chlorophyll a.

Public access to drinking water reservoirs is limited or prohibited by reservoir owner/operators for purposes of protecting drinking water quality and public health. In some cases, access to reservoir tributaries is also prohibited. For these water bodies, REC-1 is designated as E*, for the purpose of protecting water quality. No right to public access is intended by this designation.

2.1.16 NONCONTACT WATER RECREATION (REC2)

Uses of water for recreational activities involving proximity to water, but not normally involving contact with water where water ingestion is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Water quality considerations relevant to noncontact water recreation, such as hiking, camping, or boating, and those activities related to tide pool or other nature studies require protection of habitats and aesthetic features. In some cases, preservation of a natural wilderness condition is justified, particularly when nature study is a major dedicated use.

One criterion to protect the aesthetic quality of waters used for recreation from excessive algal growth is based on chlorophyll a.

2.1.17 SHELLFISH HARVESTING (SHELL)

Uses of water that support habitats suitable for the collection of crustaceans and filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sport purposes.

Shellfish harvesting areas require protection and management to preserve the resource and protect public health. The potential for disease transmission and direct poisoning of humans is of considerable concern in shellfish regulation. The bacteriological criteria for the open ocean, bays, and estuarine waters where shellfish cultivation and harvesting occur should conform with the standards described in the National Shellfish Sanitation Program, Manual of Operation.

Toxic metals can accumulate in shellfish. Mercury and cadmium are two metals known to have caused extremely disabling effects in humans who consumed shellfish that concentrated these elements from industrial waste discharges. Other elements, radioactive isotopes, and certain toxins produced by particular plankton species also concentrate in shellfish tissue. Documented cases of paralytic shellfish poisoning are not uncommon in California.

2.1.18 FISH SPAWNING (SPWN)

Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Dissolved oxygen levels in spawning areas should ideally approach saturation levels. Free movement of water is essential to maintain well-oxygenated conditions around eggs deposited in sediments. Water temperature, size distribution and organic content of sediments, water depth, and current velocity are also important determinants of spawning area adequacy.

2.1.19 WARM FRESHWATER HABITAT (WARM)

Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

The warm freshwater habitats supporting bass, bluegill, perch, and other fish are generally lakes and reservoirs, although some minor streams will serve this purpose where stream flow is sufficient to sustain the fishery. The habitat is also important to a variety of nonfish species, such as frogs, crayfish, and insects, which provide food for fish and small mammals. This habitat is less sensitive to environmental changes, but more diverse than the cold freshwater habitat, and natural fluctuations in temperature, dissolved oxygen, pH, and turbidity are usually greater.

2.1.20 WILDLIFE HABITAT (WILD)

Uses of waters that support wildlife habitats, including, but not limited to, the preservation and enhancement of vegetation and prey species used by wildlife, such as waterfowl.

The two most important types of wildlife habitat are riparian and wetland habitats. These habitats can be threatened by development, erosion, and sedimentation, as well as by poor water quality.

The water quality requirements of wildlife pertain to the water directly ingested, the aquatic habitat itself, and the effect of water quality on the production of food materials. Waterfowl habitat is particularly sensitive to changes in water quality. Dissolved oxygen, pH, alkalinity, salinity, turbidity, settleable matter, oil, toxicants, and specific disease organisms are water quality characteristics particularly important to waterfowl habitat. Dissolved oxygen is needed in waterfowl habitats to suppress development of botulism organisms; botulism has killed millions of waterfowl. It is particularly important to maintain adequate circulation and aerobic conditions in shallow fringe areas of ponds or reservoirs where botulism has caused problems.

2.2 EXISTING AND POTENTIAL BENEFICIAL USES

2.2.1 SURFACE WATERS

Surface waters in the Region consist of non-tidal wetlands, rivers, streams, and lakes (collectively described as inland surface waters), estuarine wetlands known as baylands, estuarine waters, and coastal waters. In this Region, estuarine waters consist of the Bay system including intertidal, tidal, and subtidal habitats from the Golden Gate to the Region's boundary near Pittsburg and the lower portions of streams that are affected by tidal hydrology, such as the Napa and Petaluma rivers in the north and Coyote and San Francisquito creeks in the south.

Inland surface waters support or could support most of the beneficial uses described above. The specific beneficial uses for inland streams include municipal and domestic supply (MUN), agricultural supply (AGR), commercial and sport fishing (COMM), freshwater replenishment (FRESH), industrial process supply (PRO), groundwater recharge (GWR), preservation of rare and endangered species (RARE), water contact recreation (REC1), noncontact water recreation (REC2), wildlife habitat (WILD), cold freshwater habitat (COLD), warm freshwater habitat (WARM), fish migration (MIGR), and fish spawning (SPWN).

The San Francisco Bay Estuary supports estuarine habitat (EST), industrial service supply (IND), and navigation (NAV) in addition to COMM, RARE, REC1, REC2, WILD, MIGR, and SPWN.

Coastal waters' beneficial uses include water contact recreation (REC1); noncontact water recreation (REC2); industrial service supply (IND); navigation (NAV); marine habitat (MAR); shellfish harvesting (SHELL); commercial and sport fishing (COMM); wildlife habitat (WILD), fish migration (MIGR), fish spawning (SPWN), and preservation of rare and endangered species (RARE). In addition, the California coastline within the Region is endowed with exceptional scenic beauty.

Appendix B.2 Descriptions of Beneficial Uses for CCRWQCB

CHAPTER 2. PRESENT AND POTENTIAL BENEFICIAL USES

State policy for water quality control in California is directed toward achieving the highest water quality consistent with maximum benefit to the people of the State. Therefore, all water resources must be protected from pollution and nuisance that may occur as a result of waste discharges.

Establishing the beneficial uses to be protected in the Central Coastal Basin is a cornerstone of this comprehensive plan. Once uses are recognized, compatible water quality standards can be established as well as the level of treatment necessary to maintain the standards and ensure the continuance of the beneficial uses. This chapter will examine and identify historical, present, and potential beneficial uses in the Basin.

The remainder of this chapter summarizes current beneficial uses, describes anticipated future water demands characterizing future or potential water users, and lists the present and potential beneficial uses in tabular form.

I. PRESENT AND POTENTIAL BENEFICIAL USES

Beneficial uses are presented for inland surface waters by 13 sub-basins in Table 2-1. Beneficial uses for inland surface waters are arranged by hydrologic unit on pages II-2 through II-15. A map of the hydrologic units is shown in Figure 2-1 on page II-16. Beneficial uses are regarded as existing whether the water body is perennial or ephemeral, or the flow is intermittent or continuous. Beneficial uses of coastal waters are shown in Table 2-2 on page II-17.

Surface water bodies within the Region that do not have beneficial uses designated for them in Table 2-1 are assigned the following designations:

- Municipal and Domestic Water Supply
- Protection of both recreation and aquatic life.

Municipal and Domestic Water Supply is designated in accordance with the provisions of State Water Resources Control Board Resolution 88-63 is by reference, a part of this Plan. (A copy of this resolution is located in the appendix). These MUN designations in no way affect the presence or absence of other beneficial use designations in these water bodies.

Ground water throughout the Central Coastal Basin, except for that found in the Soda Lake Sub-basin, is suitable for agricultural water supply, municipal and domestic water supply, and industrial use. Ground water basins are listed in Table 2-3. A map showing these ground water basins is displayed in Figure 2-2 on page II-19.

II. BENEFICIAL USE DEFINITIONS

Beneficial uses for surface and ground waters are divided into the twenty standard categories listed below. One of the principal purposes of this standardization is to facilitate establishment of both qualitative and numerical water quality objectives that will be compatible on a statewide basis.

Municipal and Domestic Supply (MUN) - Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply. According to State Board Resolution No. 88-63, "Sources of Drinking Water Policy" all surface waters are considered suitable, or potentially suitable, for municipal or domestic water supply except where:

a. TDS exceeds 3000 mg/l (5000 uS/cm electrical conductivity);
b. Contamination exists, that cannot reasonably be treated for domestic use;
c. The source is not sufficient to supply an average sustained yield of 200 gallons per day;

d. The water is in collection or treatment systems of municipal or industrial wastewaters, process waters, mining wastewaters, or storm water runoff; and
e. The water is in systems for conveying or holding agricultural drainage waters.

Agricultural Supply (AGR) - Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Industrial Process Supply (PROC) - Uses of water for industrial activities that depend primarily on water quality (i.e., waters used for manufacturing, food processing, etc.).

Industrial Service Supply (IND) - Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.

Ground Water Recharge (GWR) - Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers. Ground water recharge includes recharge of surface water underflow.

Freshwater Replenishment (FRSH) - Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity) which includes a water body that supplies water to a different type of water body, such as, streams that supply reservoirs and lakes, or estuaries; or reservoirs and lakes that supply streams. This includes only immediate upstream water bodies and not their tributaries.

Navigation (NAV) - Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels. This Board interprets NAV as, "Any stream, lake, arm of the sea, or other natural body of water that is actually navigable and that, by itself, or by its connections with other waters, for a period long enough to be of commercial value, is of sufficient capacity to float watercraft for the purposes of commerce, trade, transportation, and including pleasure; or any waters that have been declared navigable by the Congress of the United States" and/or the California State Lands Commission.

Hydropower Generation (POW) - Uses of water for hydropower generation.

Water Contact Recreation (REC-1) - Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

Non-Contact Water Recreation (REC-2) - Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Commercial and Sport Fishing (COMM) - Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

Aquaculture (AQUA) - Uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or bait purposes.

Warm Fresh Water Habitat (WARM) - Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Cold Fresh Water Habitat (COLD) - Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

Inland Saline Water Habitat (SAL) - Uses of water that support inland saline water ecosystems including, but not limited to, preservation or enhancement of aquatic saline habitats, vegetation, fish, or wildlife, including invertebrates. Soda Lake is a saline habitat typical of desert lakes in inland sinks.

Estuarine Habitat (EST) - Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds). An estuary is generally described as a semi-enclosed body of water having a free connection with the open sea, at least part of the year and within which the seawater is diluted at least seasonally with fresh water drained from the land. Included are water bodies which would naturally fit the definition if not controlled by tidegates or other such devices.

Marine Habitat (MAR) - Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

Wildlife Habitat (WILD) - Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Preservation of Biological Habitats of Special Significance (BIOL) - Uses of water that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS), where the preservation or enhancement of natural resources requires special protection.

Rare, Threatened, or Endangered Species (RARE) - Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered.

Migration of Aquatic Organisms (MIGR) - Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.

Spawning, Reproduction, and/or Early Development (SPWN) - Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Shellfish Harvesting (SHELL) - Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sport purposes. This includes waters that have in the past, or may in the future, contain significant shellfisheries.

Areas of Special Biological Significance (ASBS) - are those areas designated by the State Water Resources Control Board as requiring protection of species or biological communities to the extent that alteration of natural water quality is undesirable.

The following areas have been designated Areas of Special Biological Significance in the Central Coastal Basin:

1. Ano Nuevo Point and Island, San Mateo County

2 Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life Refuge, Monterey County

3. Point Lobos Ecological Reserve, Monterey County

4. Carmel Bay, Monterey County

5 Julia Pfeiffer Burns Underwater Park, Monterey County

6. Ocean area surrounding the mouth of Salmon Creek, Monterey County

7. Channel Islands, Santa Barbara County - San Miguel, Santa Rosa, Santa Cruz

An ASBS designation implies the following requirements:

Discharge of elevated temperature wastes in a manner that would alter water quality conditions from those occurring naturally will be prohibited.

Discharge of discrete, point source sewage or industrial process wastes in a manner that would alter water quality conditions from those occurring naturally will be prohibited.

Discharge of waste from nonpoint sources, including but not limited to storm water runoff, silt, and urban runoff, will be controlled to the extent practicable. In control programs for waste from nonpoint sources, Regional Boards will give high priority to areas tributary to ASBS.

Further information concerning ASBS areas can be found by reviewing Regional Board Policies in Chapter Five.

Appendix C San Francisco Bay Hydrologic Region Groundwater Data

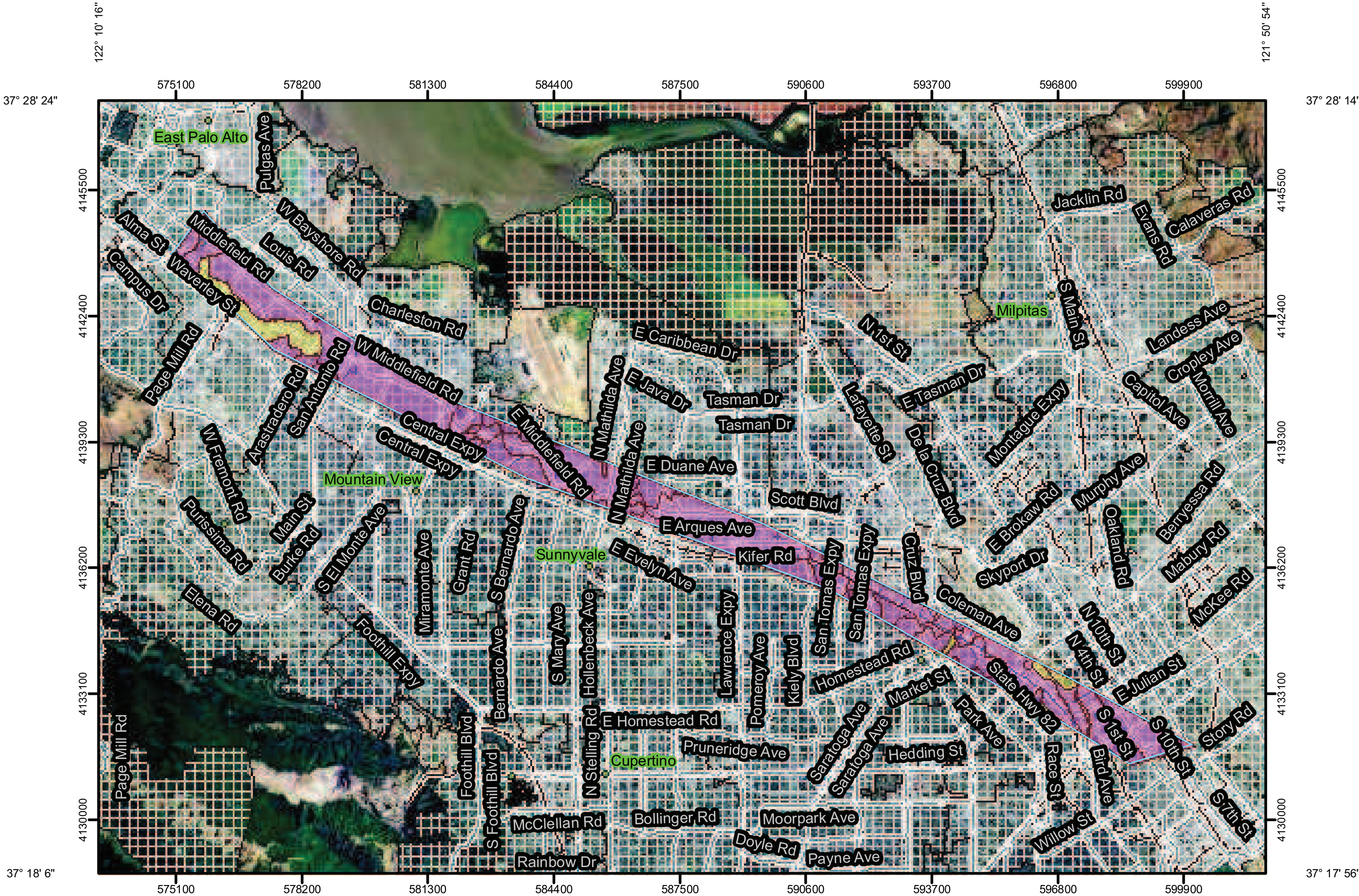
(From the Department of Water Resources)

Table 18 San Francisco Bay Hydrologic Region groundwater data

Basin/Subbasin	Basin Name	Area (acres)	Groundwater Budget Type	Well Yields (gpm)		Active Monitoring			TDS (mg/L)	
				Maximum	Average	Levels	Quality	Title 22	Average	Range
2-1	PETALUMA VALLEY	46,100	C	100	-	16	7	24	347	58-650
2-2	NAPA-SONOMA VALLEY									
2-2.01	NAPA VALLEY	45,900	A	3,000	223	19	10	23	272	150-370
2-2.02	SONOMA VALLEY	44,700	C	1,140	516	18	9	35	321	100-550
2-2.03	NAPA-SONOMA LOWLANDS	40,500	C	300	98	0	6	9	185	50-300
2-3	SUISUN-FAIRFIELD VALLEY	133,600	C	500	200	21	17	35	410	160-740
2-4	PITTSBURG PLAIN	11,600	C	-	-	-	-	9	-	-
2-5	CLAYTON VALLEY	17,800	C	-	-	-	-	48	-	-
2-6	YGNACIO VALLEY	15,500	C	-	-	-	-	-	-	-
2-7	SAN RAMON VALLEY	7,060	C	-	-	-	-	-	-	-
2-8	CASTRO VALLEY	1,820	C	-	-	-	-	-	-	-
2-9	SANTA CLARA VALLEY									
2-9.01	NILES CONE	57,900	A	3,000	2,000	350	120	20	-	-
2-9.02	SANTA CLARA	190,000	C	-	-	-	10	234	408	200-931
2-9.03	SAN MATEO PLAIN	48,100	C	-	-	-	2	14	407	300-480
2-9.04	EAST BAY PLAIN	77,400	A	1,000	UNK	29	16	7	638	364-1,420
2-10	LIVERMORE VALLEY	69,500	A	-	-	-	-	36	-	-
2-11	SUNOL VALLEY	16,600	C	-	-	-	-	2	-	-
2-19	KENWOOD VALLEY	3,170	C	-	-	-	-	13	-	-
2-22	HALF MOON BAY TERRACE	9,150	C	-	-	5	-	9	-	-
2-24	SAN GREGORIO VALLEY	1,070	C	-	-	-	-	-	-	-
2-26	PESCADERO VALLEY	2,900	C	-	-	3	-	4	-	-
2-27	SAND POINT AREA	1,400	C	-	-	-	-	6	-	-
2-28	ROSS VALLEY	1,770	C	-	-	-	-	-	-	-
2-29	SAN RAFAEL VALLEY	880	C	-	-	-	-	-	-	-
2-30	NOVATO VALLEY	20,500	C	-	-	-	-	1	-	-
2-31	ARROYO DEL HAMBRE VALLEY	790	C	-	-	-	-	-	-	-
2-32	VISITACION VALLEY	880	C	-	-	-	-	-	-	-
2-33	ISLAIS VALLEY	1,550	C	-	-	-	-	-	-	-
2-35	MERCED VALLEY	10,400	C	-	-	-	-	10	-	-
2-36	SAN PEDRO VALLEY	880	C	-	-	-	-	-	-	-
2-37	SOUTH SAN FRANCISCO	2,170	C	-	-	-	-	-	-	-
2-38	LOBOS	2,400	A	-	-	-	-	-	-	-
2-39	MARINA	220	A	-	-	-	-	-	-	-
2-40	DOWNTOWN SAN FRANCISCO	7,600	C	-	-	-	-	-	-	-

Appendix D Soil Information

(From the Natural Resources Conservation Service- Web Soil Survey)



Map Scale: 1:136,000 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 | 1,500 | 3,000 | 6,000 | 9,000

Feet: 0 | 5,000 | 10,000 | 20,000 | 30,000

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:136,000 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Santa Clara Area, California, Western Part
Survey Area Data: Version 1, Jul 27, 2010

Date(s) aerial images were photographed: 6/12/2005; 6/13/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Santa Clara Area, California, Western Part (CA641)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
101	Urban land, 0 to 2 percent slopes, basins	D	1,059.5	15.6%
102	Urban land, 0 to 2 percent slopes, alluvial fans	D	88.1	1.3%
131	Urban land-Elpaloalto complex, 0 to 2 percent slopes	D	322.7	4.7%
135	Urban land-Stevenscreek complex, 0 to 2 percent slopes	D	357.0	5.3%
140	Urban land-Flaskan complex, 0 to 2 percent slopes	D	216.6	3.2%
145	Urbanland-Hangerone complex, 0 to 2 percent slopes, drained	D	2,304.0	33.9%
146	Hangerone clay loam, drained, 0 to 2 percent slopes	C	29.8	0.4%
150	Urbanland-Embarcadero complex, 0 to 2 percent slopes, drained	D	2.9	0.0%
160	Urbanland-Clear Lake complex, 0 to 2 percent slopes	C	419.5	6.2%
165	Urbanland-Campbell complex, 0 to 2 percent slopes, protected	D	1,547.8	22.8%
166	Campbell silt loam, 0 to 2 percent slopes, protected	C	42.8	0.6%
171	Elder fine sandy loam, 0 to 2 percent slopes, rarely flooded	A	18.2	0.3%
180	Urbanland-Newpark complex, 0 to 2 percent slopes	D	99.5	1.5%
185	Urban Land - Bayshore complex, 0 to 2 percent slopes, drained	D	248.2	3.7%
317	Urbanland-Cropley complex, 0 to 2 percent slopes	D	37.8	0.6%
Totals for Area of Interest			**6,794.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

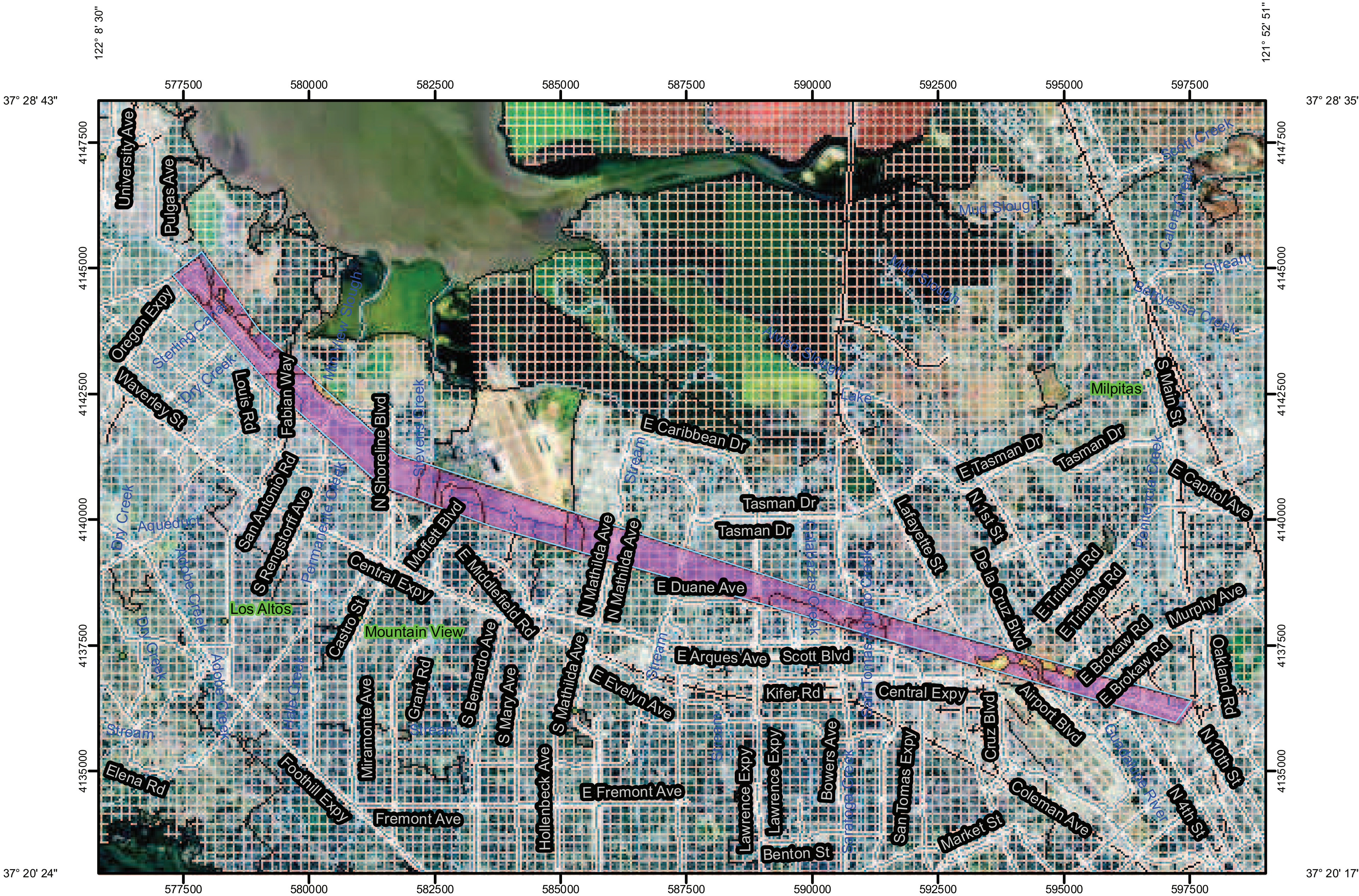
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher



Map Scale: 1:110,000 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 — 1,500 — 3,000 — 6,000 — 9,000

Feet: 0 — 5,000 — 10,000 — 20,000 — 30,000

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

MAP INFORMATION

Map Scale: 1:110,000 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Santa Clara Area, California, Western Part
Survey Area Data: Version 1, Jul 27, 2010

Date(s) aerial images were photographed: 6/12/2005; 6/13/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Santa Clara Area, California, Western Part (CA641)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
101	Urban land, 0 to 2 percent slopes, basins	D	375.4	11.2%
102	Urban land, 0 to 2 percent slopes, alluvial fans	D	47.1	1.4%
120	Aquic Xerorthents, bay mud subtratum, 0 to 2 percent slopes	B	18.8	0.6%
121	Aquic Xerorthents, bay mud substratum, 2 to 5 percent slopes	B	2.5	0.1%
145	Urbanland-Hangerone complex, 0 to 2 percent slopes, drained	D	1,778.0	53.2%
146	Hangerone clay loam, drained, 0 to 2 percent slopes	C	52.6	1.6%
150	Urbanland-Embarcadero complex, 0 to 2 percent slopes, drained	D	199.2	6.0%
157	Novato clay, 0 to 1 percent slopes, protected	D	94.3	2.8%
165	Urbanland-Campbell complex, 0 to 2 percent slopes, protected	D	532.0	15.9%
166	Campbell silt loam, 0 to 2 percent slopes, protected	C	39.2	1.2%
169	Urbanland-Elder complex, 0 to 2 percent slopes, protected	D	0.2	0.0%
171	Elder fine sandy loam, 0 to 2 percent slopes, rarely flooded	A	20.4	0.6%
185	Urban Land - Bayshore complex, 0 to 2 percent slopes, drained	D	166.1	5.0%
W	Water		19.0	0.6%
Totals for Area of Interest			**3,340.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

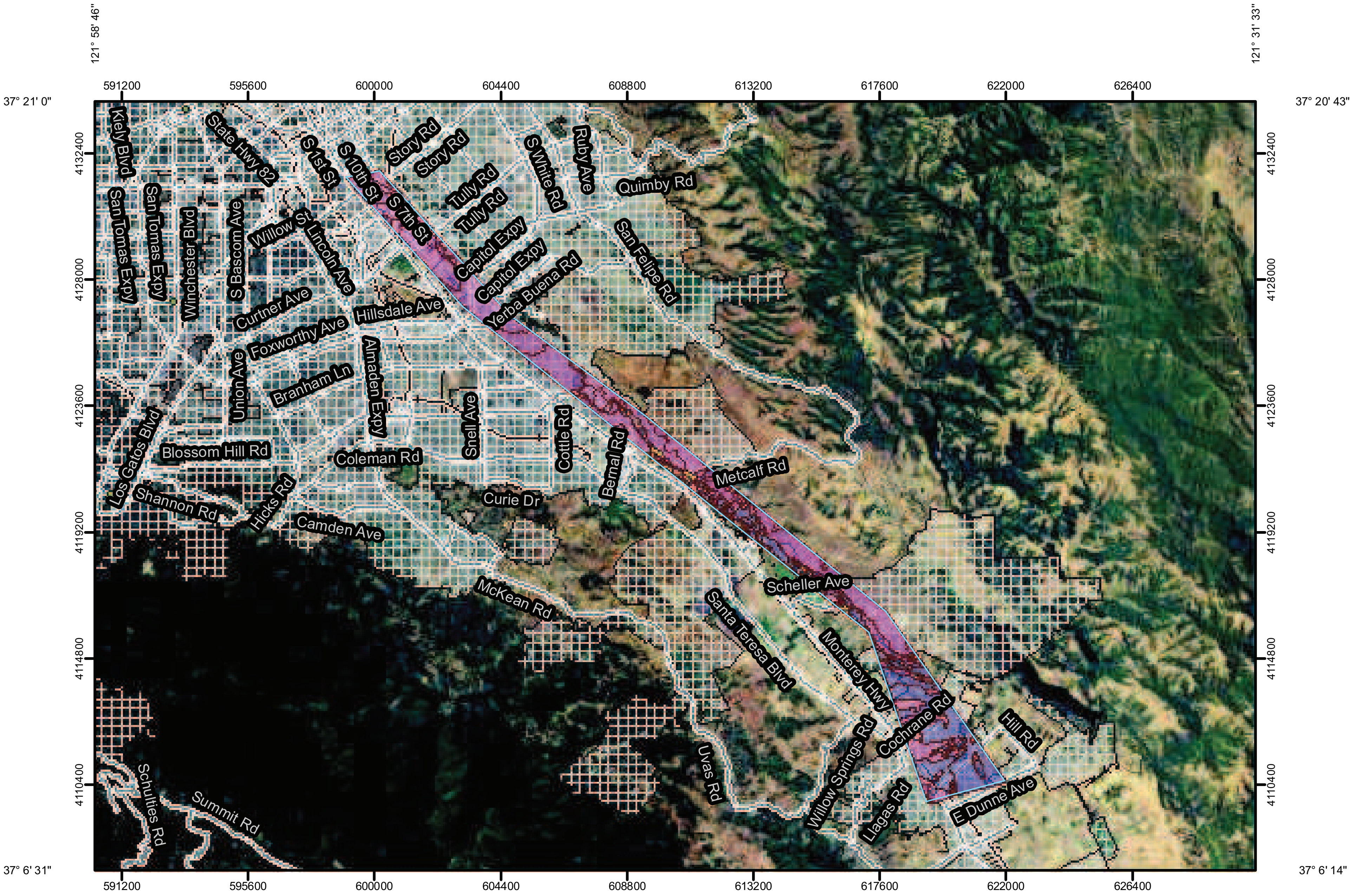
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher



Map Scale: 1:192,000 if printed on A size (8.5" x 11") sheet.

N

Meters: 0, 2,500, 5,000, 10,000, 15,000

Feet: 0, 10,000, 20,000, 40,000, 60,000

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

Cities

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:192,000 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Eastern Santa Clara Area, California
Survey Area Data: Version 6, Jul 27, 2010

Soil Survey Area: Santa Clara Area, California, Western Part
Survey Area Data: Version 1, Jul 27, 2010

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 6/13/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Eastern Santa Clara Area, California (CA646)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
303scl	Montara-Santerhill complex, 15 to 30 percent slopes	D	127.4	1.5%
315scl	Cropley clay, 0 to 2 percent slopes	C	1.9	0.0%
AcE	Altamont clay, 15 to 30 percent slopes	D	97.6	1.1%
AcF	Altamont clay, 30 to 50 percent slopes	D	13.7	0.2%
ArA	Arbuckle gravelly loam, 0 to 2 percent slopes	B	1,173.4	13.5%
ClD	Climara clay, 9 to 30 percent slopes	D	108.9	1.3%
CoB	Cortina very gravelly loam, 0 to 5 percent slopes	A	142.3	1.6%
CrA	Cropley clay, 0 to 2 percent slopes	D	21.9	0.3%
DaD	Diablo clay, 9 to 15 percent slopes	C	76.4	0.9%
GaA	Garretson loam, gravel substratum, 0 to 2 percent slopes	B	288.6	3.3%
GoE2	Gilroy clay loam, 15 to 30 percent slopes, eroded	C	0.3	0.0%
GoF	Gilroy clay loam, 30 to 50 percent slopes	C	14.8	0.2%
GP	GRAVEL PITS		12.1	0.1%
InG2	Inks rocky clay loam, 50 to 75 percent slopes, eroded	D	175.1	2.0%
LrC	Los Robles clay loam, 2 to 9 percent slopes	B	66.5	0.8%
McB	Maxwell clay, 0 to 5 percent slopes	D	74.1	0.9%
MwF2	Montara rocky clay loam, 15 to 50 percent slopes, eroded	D	950.8	11.0%
PoA	Pleasanton loam, 0 to 2 percent slopes	B	381.5	4.4%
Rg	Riverwash	D	86.9	1.0%
RnG	Rock land	D	42.9	0.5%
SbE2	San Benito clay loam, 15 to 30 percent slopes, eroded	B	65.0	0.7%
SbF3	San Benito clay loam, 30 to 50 percent slopes, severely eroded	B	348.6	4.0%
SdA	San Ysidro loam, 0 to 2 percent slopes	D	593.7	6.8%
W	WATER		9.3	0.1%
YaA	Yolo loam, 0 to 2 percent slopes	B	13.3	0.2%
YeA	Yolo silty clay loam, 0 to 2 percent slopes	B	0.1	0.0%
YeC	Yolo silty clay loam, 2 to 9 percent slopes	B	40.3	0.5%

Hydrologic Soil Group— Summary by Map Unit — Eastern Santa Clara Area, California (CA646)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
Subtotals for Soil Survey Area			**4,927.4**	**56.8%**
Totals for Area of Interest			**8,672.0**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — Santa Clara Area, California, Western Part (CA641)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
102	Urban land, 0 to 2 percent slopes, alluvial fans	D	120.0	1.4%
130	Urban land-Still complex, 0 to 2 percent slopes	D	124.3	1.4%
131	Urban land-Elpaloalto complex, 0 to 2 percent slopes	D	1,730.0	19.9%
145	Urbanland-Hangerone complex, 0 to 2 percent slopes, drained	D	46.9	0.5%
165	Urbanland-Campbell complex, 0 to 2 percent slopes, protected	D	176.4	2.0%
173	Caninecreek-Elder complex, 0 to 2 percent slopes, rarely flooded	A	164.4	1.9%
178	Caninecreek-Elder complex, 1 to 5 percent slopes, protected	A	6.5	0.1%
180	Urbanland-Newpark complex, 0 to 2 percent slopes	D	575.1	6.6%
300	Urbanland-Montara complex, 15 to 30 percent slopes	D	234.4	2.7%
303	Montara-Santerhill complex, 15 to 30 percent slopes	D	14.9	0.2%
305	Alo-Altamont complex, 15 to 30 percent slopes	D	216.2	2.5%
309	Urbanland-Altamont-Alo complex, 9 to 15 percent slopes	D	235.2	2.7%
315	Cropley clay, 0 to 2 percent slopes	C	46.5	0.5%
317	Urbanland-Cropley complex, 0 to 2 percent slopes	D	0.9	0.0%
385	Alo-Altamont complex, 9 to 15 percent slopes	D	9.6	0.1%
W	Water		54.7	0.6%
Subtotals for Soil Survey Area			**3,756.1**	**43.3%**
Totals for Area of Interest			**8,672.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

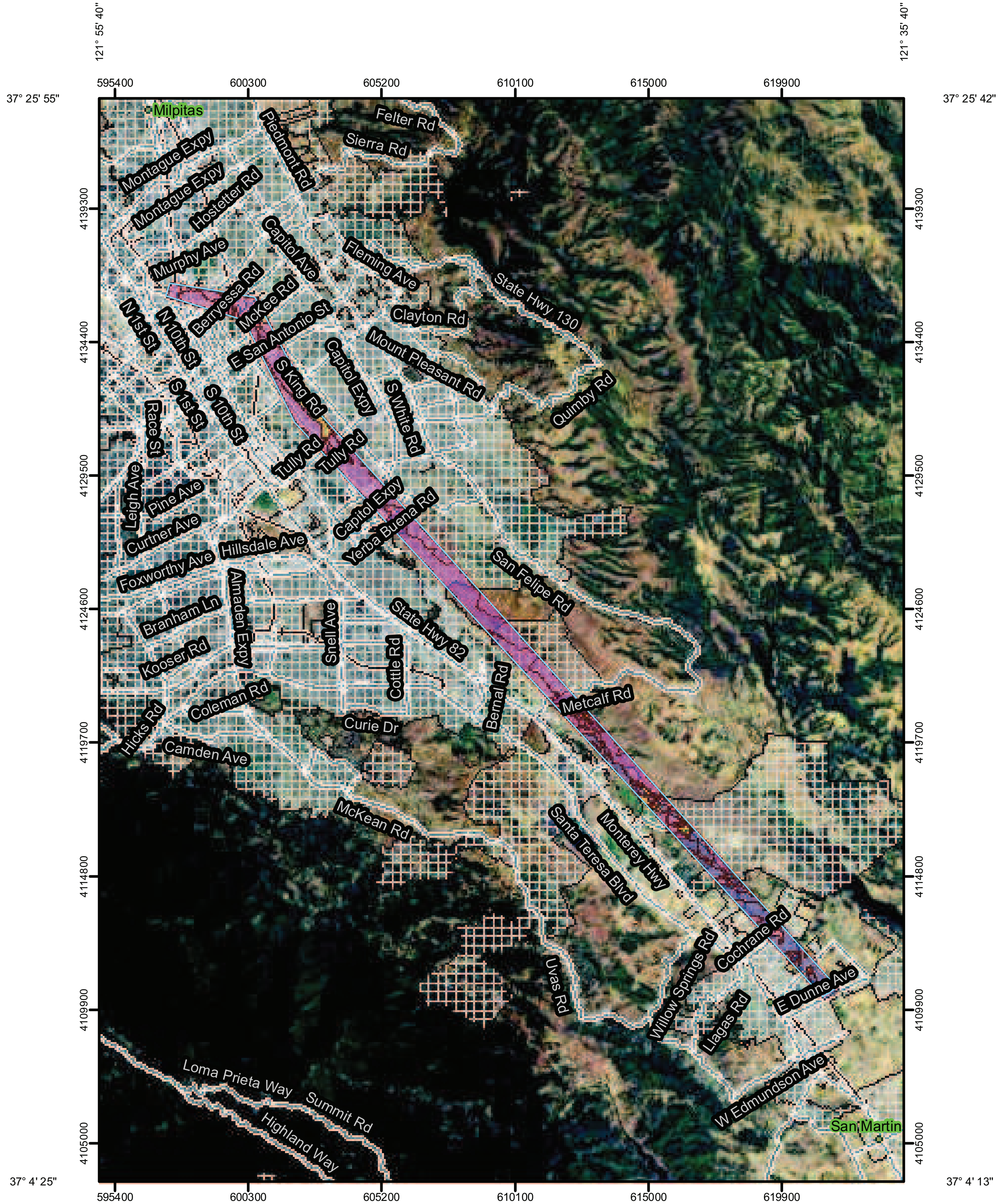
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



Map Scale: 1:190,000 if printed on A size (8.5" x 11") sheet.

Meters: 0 1,500 3,000 6,000 9,000

Feet: 0 5,000 10,000 20,000 30,000

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

MAP INFORMATION

Map Scale: 1:190,000 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Eastern Santa Clara Area, California
Survey Area Data: Version 6, Jul 27, 2010

Soil Survey Area: Santa Clara Area, California, Western Part
Survey Area Data: Version 1, Jul 27, 2010

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Eastern Santa Clara Area, California (CA646)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
303scl	Montara-Santerhill complex, 15 to 30 percent slopes	D	154.9	2.3%
AcE	Altamont clay, 15 to 30 percent slopes	D	86.4	1.3%
AcF	Altamont clay, 30 to 50 percent slopes	D	13.7	0.2%
ArA	Arbuckle gravelly loam, 0 to 2 percent slopes	B	551.6	8.1%
ClD	Climara clay, 9 to 30 percent slopes	D	81.4	1.2%
CoB	Cortina very gravelly loam, 0 to 5 percent slopes	A	21.1	0.3%
DaD	Diablo clay, 9 to 15 percent slopes	C	99.7	1.5%
GaA	Garretson loam, gravel substratum, 0 to 2 percent slopes	B	212.3	3.1%
GoF	Gilroy clay loam, 30 to 50 percent slopes	C	15.7	0.2%
HfD2	Hillgate silt loam, 9 to 15 percent slopes, eroded	D	19.6	0.3%
InG2	Inks rocky clay loam, 50 to 75 percent slopes, eroded	D	72.2	1.1%
LrC	Los Robles clay loam, 2 to 9 percent slopes	B	20.9	0.3%
McB	Maxwell clay, 0 to 5 percent slopes	D	118.7	1.7%
MwF2	Montara rocky clay loam, 15 to 50 percent slopes, eroded	D	317.8	4.7%
PoA	Pleasanton loam, 0 to 2 percent slopes	B	68.7	1.0%
Rg	Riverwash	D	46.9	0.7%
RnG	Rock land	D	70.6	1.0%
SbE2	San Benito clay loam, 15 to 30 percent slopes, eroded	B	37.7	0.6%
SbF3	San Benito clay loam, 30 to 50 percent slopes, severely eroded	B	338.0	5.0%
SdA	San Ysidro loam, 0 to 2 percent slopes	D	122.1	1.8%
TeF	Terrace escarpments		0.2	0.0%
W	WATER		1.0	0.0%
YaA	Yolo loam, 0 to 2 percent slopes	B	9.6	0.1%
YeC	Yolo silty clay loam, 2 to 9 percent slopes	B	90.2	1.3%
Subtotals for Soil Survey Area			**2,570.8**	**37.7%**
Totals for Area of Interest			**6,819.9**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — Santa Clara Area, California, Western Part (CA641)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
102	Urban land, 0 to 2 percent slopes, alluvial fans	D	160.0	2.3%
130	Urban land-Still complex, 0 to 2 percent slopes	D	250.0	3.7%
131	Urban land-Elpaloalto complex, 0 to 2 percent slopes	D	992.7	14.6%
160	Urbanland-Clear Lake complex, 0 to 2 percent slopes	C	180.6	2.6%
165	Urbanland-Campbell complex, 0 to 2 percent slopes, protected	D	147.5	2.2%
173	Caninecreek-Elder complex, 0 to 2 percent slopes, rarely flooded	A	13.4	0.2%
174	Urban Land-Caninecreek-Elder complex, 0 to 2 percent slopes	D	111.6	1.6%
180	Urbanland-Newpark complex, 0 to 2 percent slopes	D	520.3	7.6%
302	Montara-Rock outcrop complex, 30 to 50 percent slopes	D	1,015.4	14.9%
303	Montara-Santerhill complex, 15 to 30 percent slopes	D	486.9	7.1%
305	Alo-Altamont complex, 15 to 30 percent slopes	D	317.9	4.7%
309	Urbanland-Altamont-Alo complex, 9 to 15 percent slopes	D	5.1	0.1%
317	Urbanland-Cropley complex, 0 to 2 percent slopes	D	47.8	0.7%
Subtotals for Soil Survey Area			**4,249.4**	**62.3%**
Totals for Area of Interest			**6,819.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Appendix E Memorandum of California Department of Transportation Post-Construction Stormwater and Hydromodification Standards

California Regional Water Quality Control Board
San Francisco Bay Region

1515 Clay Street, Suite 1400, Oakland, California 94612
(510) 622-2300 • Fax (510) 622-2460
http://www.waterboards.ca.gov/sanfranciscobay

Linda S. Adams
Secretary for
Environmental Protection

Arnold Schwarzenegger
Governor

Date: July 21, 2008
CIWQS Place No. 212806 (BT)

California Department of Transportation
Attn. Mr. James Richards
P.O. Box 23660
Oakland, CA 94623-0660

Subject: Memorandum of California Department of Transportation Post-Construction Stormwater and Hydromodification Standards

Dear Mr. Richards:

This letter serves to inform the California Department of Transportation (Department) of the post-construction stormwater and hydromodification requirements applicable to Department projects in the jurisdiction of the San Francisco Bay Regional Water Quality Control Board (Water Board).

Post-construction stormwater

The Department is currently required by the Statewide Storm Water Permit (Order No. 99-06-DWQ)(Statewide Permit) to ensure installation and operation of post-construction treatment controls for stormwater on its projects to the Maximum Extent Practicable. Additionally, Department projects that require a Report of Waste Discharge be submitted to the Water Board are also required to incorporate post-construction stormwater treatment controls at a level that shall treat stormwater runoff from an area equivalent to the Project's added and reworked impervious area. The Water Board requires that treatment controls be provided to treat the full spectrum of stormwater pollutant constituents, including, but not limited to trash, total suspended solids, total dissolved solids, metals and any pollutants of concern (e.g., pollutant that impair receiving water bodies).

The Department may provide off-site treatment of stormwater runoff in instances the Department is unable to provide the full level of mandated treatment on-site. Such off-site stormwater treatment mitigation must be equivalent in water quality benefit to the foregone on-site treatment and be identified prior to the Water Board's issuance of 401 water quality certification and/or Waste Discharge Requirements. Also, the Department must fully demonstrate that on-site treatment opportunities have been fully exhausted before off-site treatment may be allowed. Given the procedural challenges identifying and securing off-site treatment opportunities, the Water Board strongly encourages the Department to provide the mandated level of stormwater treatment on-site.

Hydromodification

Hydromodification refers to the modification of a stream's hydrograph, caused in general by increases in flows and durations that result when land is developed (e.g., made more impervious). The effects of hydromodification include, but are not limited to, increased bed and bank erosion, loss of habitat, increased sediment transport and deposition, and increased flooding.

The Department is not currently required by the Statewide Permit to implement hydromodification controls for its projects, however, the Water Board requires Department projects to implement hydromodification controls when that project submits a Report of Waste Discharge and lies within the political boundary of a municipality subject to hydromodification requirements in a National Pollutant Discharge Elimination System (NPDES) municipal permit. Currently, areas subject to hydromodification requirements through an NPDES municipal permit include portions of San Mateo, Alameda, Santa Clara, Contra Costa, and Solano Counties. The Department shall implement hydromodification measures at a level equivalent to or greater than that required of the local municipality.

Please note that hydromodification mitigation measures must be identified in detail prior to the Water Board's issuance of 401 water quality certification and/or Waste Discharge Requirements.

Should you have any questions, please contact Brendan Thompson of my staff at (510) 622-2506 or via email to BThompson@waterboards.ca.gov.

Sincerely,

Shin-Roei Lee for

Bruce H. Wolfe
Executive Officer

cc (via e-mail): Mr. Norman Gonsalvez, Caltrans
Mr. Hardeep Takhar, Caltrans