Water Quality Assessment

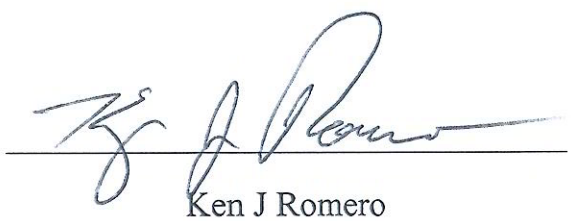
California Department of Transportation
District 6, Fresno

WATER QUALITY ASSESSMENT REPORT

For
Ferguson Slide Restoration Project
State Route 140
Mariposa County

PM 42.0 to 42.7
EA 10-0P9200

October 6, 2010



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1.0 INTRODUCTION

The California Department of Transportation (Caltrans) proposes to restore the section of State Route 140 in Mariposa County that was damaged by the Ferguson rockslide.

1.1 Project Location & Description

The project is located in Mariposa County on State Route (SR) 140 between the towns of Mariposa and El Portal at Post Mile (PM) 42.0/42.7). In April 2006, rockslides damaged and blocked State Route 140 between Mariposa and El Portal. The Ferguson rockslide covered State Route 140, and the highway was closed to traffic from 8 miles east of Briceburg to approximately 7.6 miles west of El Portal.

In August 2006, Caltrans completed the construction of the temporary detour that bypassed the rockslide and on August 18, reopened State Route 140 to vehicles fewer than 28 feet long. The temporary detour consisted of two single-lane bridges that crossed the Merced River upstream and downstream of the rockslide and connected to a single-lane paved section of Incline Road directly across the river from the rockslide. The closure of State Route 140 and the restricted vehicle length on the temporary detour created hardships for residents and businesses in the area, as well as prevented tour buses and deterred many recreational travelers from using State Route 140 to enter Yosemite National Park. In addition, a main source of income to Mariposa, tourism revenue decreased, mostly due to the vehicle length restriction on the temporary detour, which prevented many tour buses and recreational vehicles from traveling to Yosemite on State Route 140.

Caltrans, regulatory agencies, and Mariposa County officials began working on another temporary solution that would accommodate vehicles of greater lengths while the permanent project would be developed. The new, longer-term, temporary solution involved the construction of two temporary bridges across the Merced River on a skewed alignment adjacent to the existing temporary bridges. These bridges would serve as the new temporary State Route 140 detour and the first set of temporary bridges would be removed. The project was completed in June 2008.

The purpose of the project is to reopen and restore full access to the section of State Route 140 damaged by the Ferguson rockslide. Currently, motorists use a temporary bypass route to travel this portion of State Route 140. Restoration of State Route 140 would provide full access to all traffic using State Route 140 between the town of Mariposa and Yosemite National Park. Full highway access for this portion of State Route 140 would accommodate all types of vehicles with some length restrictions, equivalent to the restrictions that were in place before the slide occurred. Figures 1-1 and 1-2 show the project vicinity and location maps.

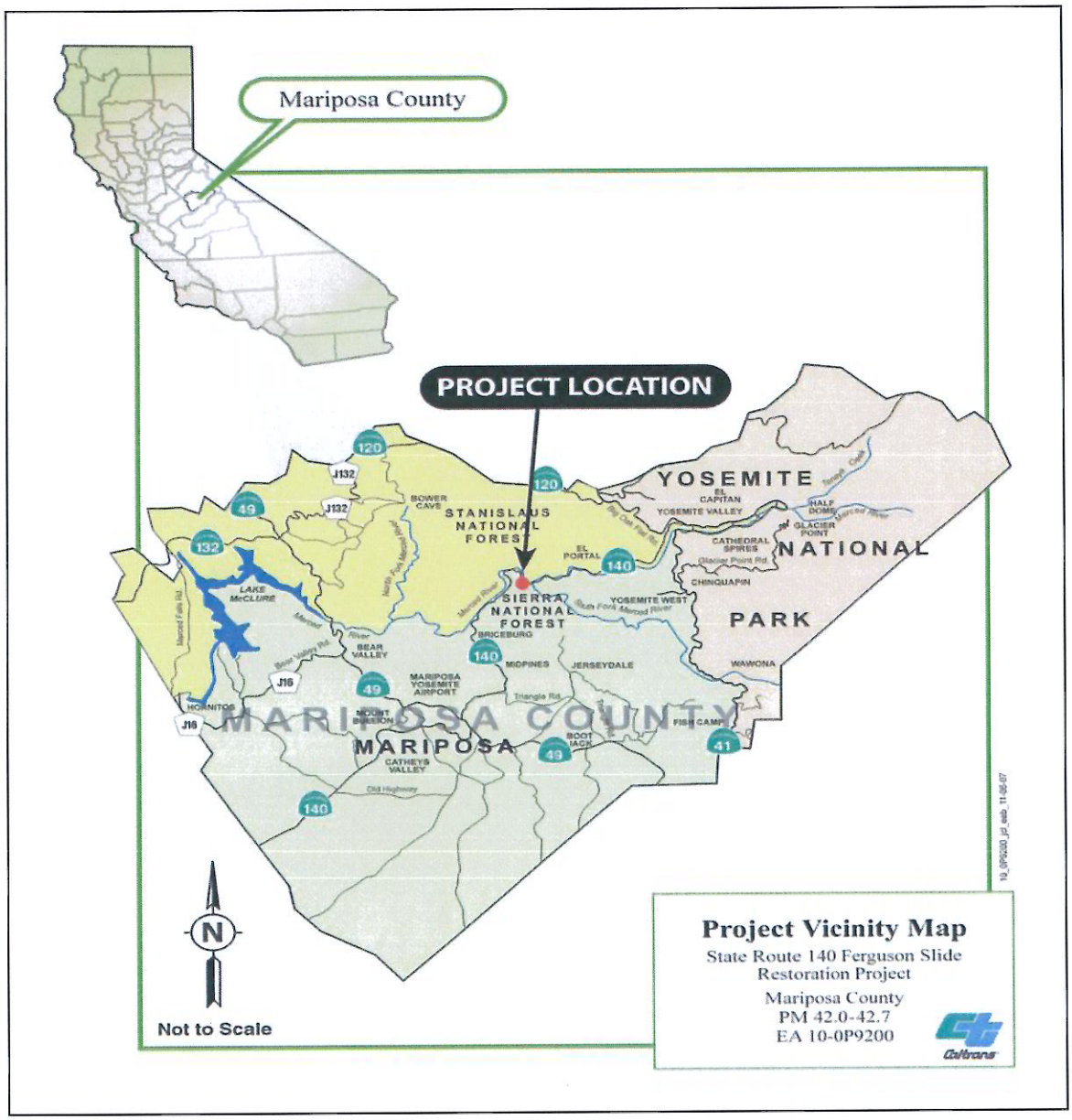

Figure 1-1 Project Vicinity Map

Six build alternatives and one no-build alternative are being considered.

1.2 Build Alternatives

The following alternatives propose to fully reopen State Route 140 either on the existing alignment by tunneling under the slide or by realigning the highway north of the Merced River and bypassing the rockslide. Figure 1-3 shows the aerial photo of the project area and Figure 1-4 shows the photo of the slide. The following alternatives are being considered:

Alternative C (Open Cut Realignment) - This alternative proposes to realign State Route 140 by constructing two bridges across the Merced River and an open cut through the hillside located on the north side of the river. The roadway would provide two 12 ft lanes, 8 ft outside shoulders and 22 ft surface debris benches through the cut areas. This alternative includes a 550 ft horizontal curve at the west end and a 550 ft horizontal curve at the east end. The proposed bridges are located within the limits of the horizontal curves. The bridge piers will be constructed within the two-year flood flow of the river. The right bank pier of the upstream bridge will placed at the edge of the Q2 water level. The columns for these concrete bridges are 11 feet in diameter. The bridges are approximately 550 ft and 650 ft in length. The design of the upstream bridge will slightly change the speed and force of the river's flow from its natural conditions (approximated to be 1 to 1.5 feet per second). The downstream bridge would not affect the movement of the sediments.

Alternative S (Viaduct Realignment) - This alternative proposes to realign State Route 140 by constructing two bridges across the Merced River and a side-hill viaduct/retaining wall on the north side of the river between the two bridges. The roadway would provide two 12 ft lanes and 8 ft outside shoulders. This alternative includes a 550 ft horizontal curve at the west end and a 650 ft horizontal curve at the east end. The proposed bridges are located within the limits of the horizontal curves. The upstream bridge piers will be constructed within the Q2 flow of the river. The downstream piers will be largely placed out of the river flow, and will have minimal to no affect on stream hydraulics. The columns for these concrete bridges are 11 feet in diameter. The bridges would be 805 and 725 feet long. The bridges are approximately 805 ft and 725 ft in length. The viaduct between the two bridges is approximately 358 ft in length.

Alternative T (Northerly Tunnel Realignment) - This alternative proposes to realign State Route 140 by constructing two bridges across the Merced River and tunneling through the hillside located on the north side of the river. The tunnel would be 700 ft in length and the roadway would provide two 12 ft lanes, 8 ft outside shoulders and 4 ft emergency walkways through the tunnel section. This alternative includes a 550 ft horizontal curve at the west end and a 550 ft horizontal curve at the east end.
The upstream and the downstream bridge piers will be constructed within the two-year flood flow of the river. The right bank pier of the upstream bridge will placed at the edge of the Q2 water level. The columns for these concrete bridges are 11 feet in diameter. The bridges are approximately 550 ft and 650 ft in length. The design of the upstream bridge will slightly change the speed and force of the river's flow from its natural conditions (approximated to be 1 to 1.5 feet per second). The downstream bridge would not affect the movement of the sediments.

Alternative R – Rock Shed (Cut and Cover Tunnel) - This alternative proposes to construct a rockshed (cut and cover tunnel) through the talus of the slide along the existing State Route 140 alignment. The rockshed would be 760 ft long providing two 12 ft lanes,

8 ft outside shoulders and a 4 ft emergency egress walkway on the river's side. The rockshed would be a reinforced concrete box structure supported on 20 ft long concrete piles and anchored with tie-backs into the west canyon wall. Retaining walls would be required on the approach ends of the structure to retain cuts that would be necessary for construction as well as to retain backfill material that would be placed on top of the structure to provide protection from future slides and rock falls.

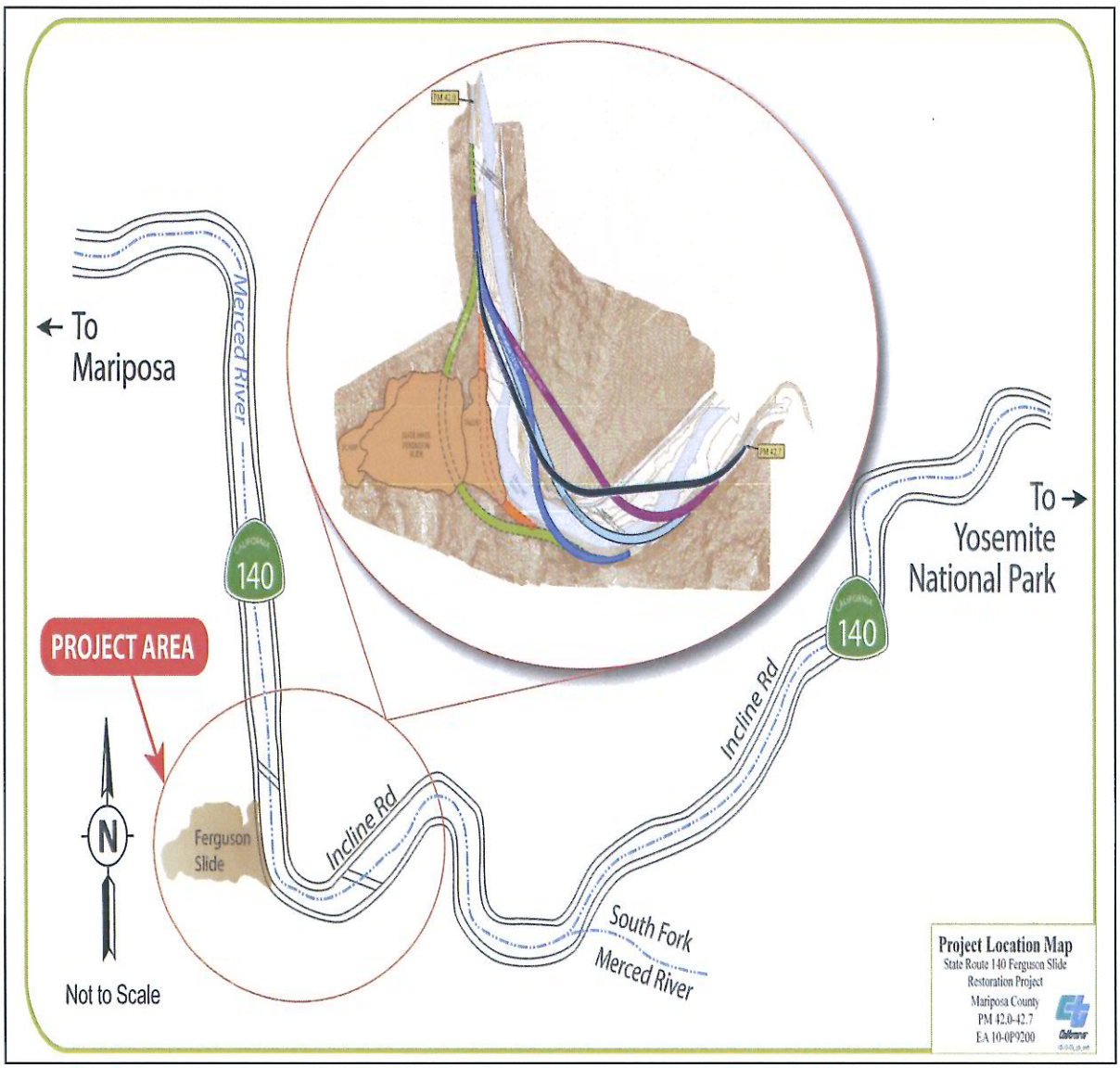

Figure 1-2 Proposed Project Alternatives Map

Alternative T-3 (Tunnel Under Slide) – This alternative would realign the State Route 140 under the area of the slide. The tunnel would be 2200 ft long providing two 12 ft lanes, 8 ft outside shoulders and 4 ft emergency walkways. A tunnel operations and maintenance facility located reasonably adjacent to the tunnel itself would be needed along with routine 24-hour supervision of the emergency monitoring and reporting systems.

Alternative S-2 (Viaduct Realignment) - Alternative S-2 is similar to Alternative S and would realign the highway to the northeast, spanning the Merced River with two bridges and bypassing the rockslide with a hillside viaduct and retaining wall. This alternative differs from Alternative S in that it proposes two different bridge type variations along with their own specific roadway alignments. The variations are referred to as S2V1 and S2V2 and described below:

Alternative S2V1

This variation would construct two tied-arch bridges. A tied-arch bridge uses an arch structure with cables placed above the bridge deck for support. The lengths of the S2V1 tied-arch bridges would be 700 feet and 790 feet. The viaduct between the two bridges would be 510 feet in length. A 10-foot wide rock fall area would be constructed in between the roadway and cut slope. The highway would be constructed with two 12-foot lanes and 8-foot outside shoulders. The bridge piers would be constructed above the Q2 or active bankfull river channel. The free flowing condition of the river would not be permanently impeded.

Alternative S2V2

This variation would construct two slant-leg bridges. A slant-leg bridge uses "V" shaped columns to support the bridge deck. The slant-leg bridge may also be referred to as a V-Bent bridge. The lengths of the S2V2 slant-leg bridges would be 860 feet and 700 feet. The viaduct between the two bridges would be 65 feet in length. A 10-foot wide rock fall area would be constructed in between the roadway and cut slope. The highway would be constructed with two 12-foot lanes and 8-foot outside shoulders. The bridge piers would be constructed above the Q2 or active bankfull river channel. The free flowing condition of the river would not be permanently impeded.

All of the proposed build alternatives would remove the pavement along Incline Road and restore it to its natural condition as a recreational trail. There would be no access to the Incline Road recreational trail from the new roadway. Travelers would need to access the recreational trail by driving beyond the project area limits and cross the river at Foresta Bridge as they did prior to the rockslide.

For Alternatives C, T, S, S-2, and T-3, the abandoned section of State Route 140 would be removed, re-vegetated, and the impervious coverage reduced. Alternative R proposes to construct on the existing alignment.

The proposed build alternatives include the removal of the temporary detour bridges once construction has been completed. The temporary detour would need to remain in place during construction so that vehicles could travel through the project area. Alternatives C, T, S, and S2-V1 would require the construction of a third temporary bridge just upstream from the current temporary bridges. The current Incline Road pavement would be extended 393 feet to meet the new temporary bridge. Once construction is complete, the bridge and pavement would be removed. For the No-build, the temporary bridges would remain in place until the eventual failure of the bridges occur and require removal or become damaged by floodwaters.

For the build alternatives, all slopes would be cut at a 1:4 ratio. The surface area per Alternative proposing cuts is described as follows: Alternative C – 4.60 acres, Alternative S – 0.25 acre, Alternative S2-V1 – 0.35 acre, Alternative S2-V2 – 0.04 acre

1.3 No Build Alternative

The No-Build Alternative is considered the temporary detour and would become the permanent State Route 140 alignment. The traffic signals controlling the single-lane access through the detour would remain in operation. The temporary detour was constructed during a declared emergency and was designed as a temporary solution to the closure of State Route 140 with an agreement with regulatory agencies that the pavement and structures used for the detour would be removed once a permanent solution could be constructed. Additionally, the No-Build Alternative bridges are temporary with a limited life span, which would require them to be removed from either wear or damage from flooding. When their removal becomes necessary, the highway would become permanently closed.

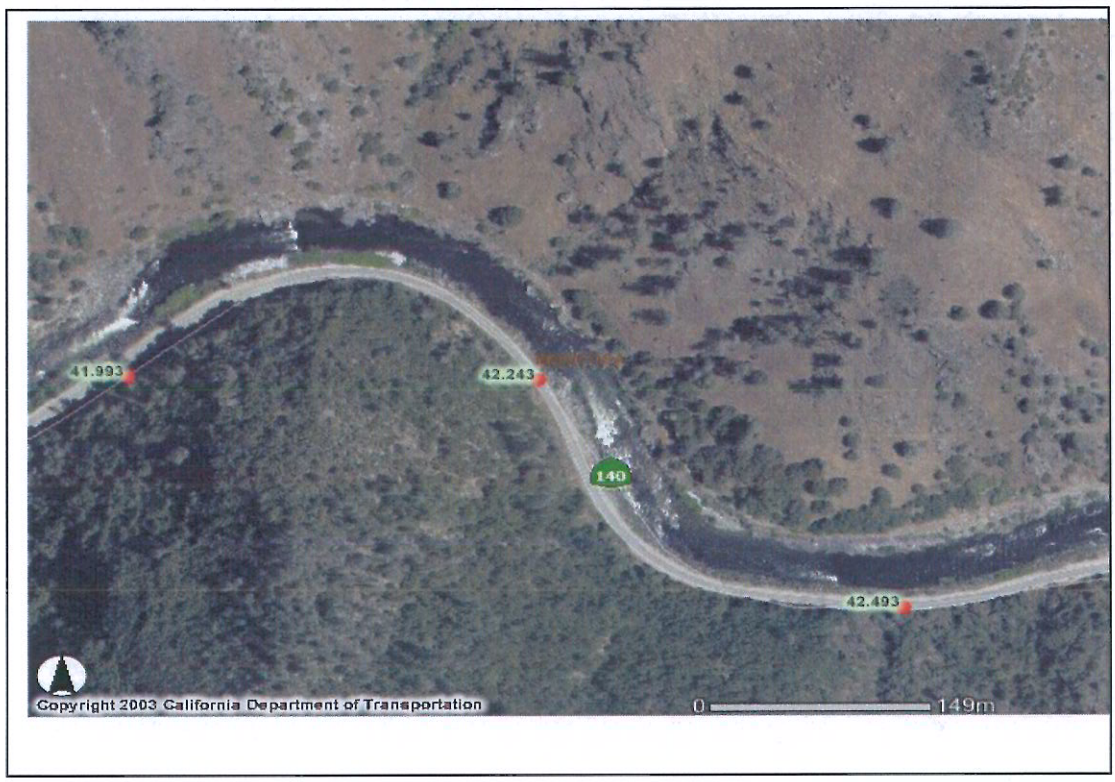

Figure 1-3. Project Aerial Map

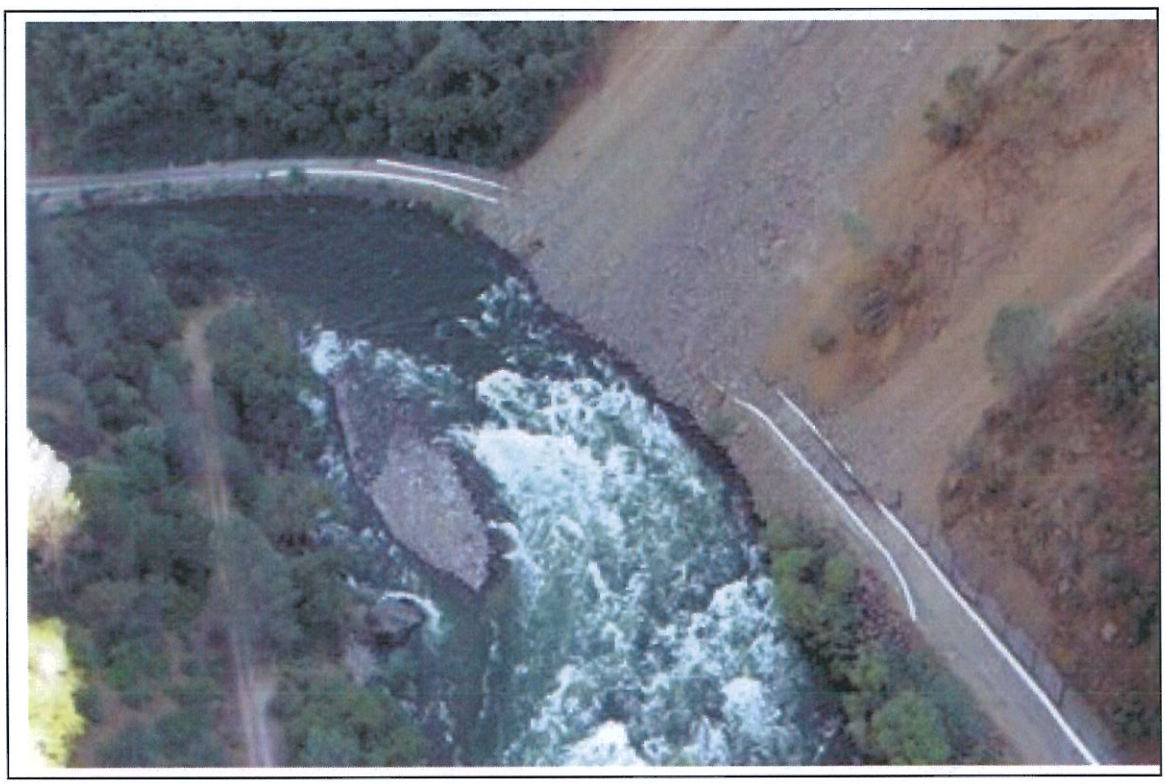

Figure 1-4. Ferguson Slide Photo

2.0 APPROACH TO WATER QUALITY ASSESSMENT REPORT

The purpose of this Water Quality Assessment (WQA) report is to identify potential impacts of the proposed project on water quality and associated beneficial uses. The WQA identifies impacts on surface water and groundwater resources resulting from this project, and describes potential avoidance or minimization measures to address the impacts. This technical report will be incorporated into a joint environmental document, to be prepared under the guidelines of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

The WQA determines if project induced effects would have an adverse impact on water quality. Significance is based on whether discharges to receiving waters would cause exceedences of water quality objectives or have an adverse impact on the beneficial uses identified by the Regional Water Quality Control Board (RWQCB).

For the purposes of this WQA, an impact is considered adverse if the proposed project would:

- Violate any water quality standards or waste discharge requirements;
- Substantially alter the existing drainage pattern of the site or area, including alteration of a stream or river in a manner that would result in substantial erosion or siltation on or off-site;
- Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems, or cause substantial additional sources of polluted runoff;
- Otherwise substantially degrade water quality;
- Place within 100-year floodplain area structures, which would impede or redirect flood flows.

This report describes the environmental and regulatory setting, the environmental impacts of the project, and measures to avoid or minimize adverse impacts to water quality.

3.0 REGULATORY SEETING

Federal Requirements: Clean Water Act

In 1972, the Federal Water Pollution Control Act was amended, making the discharge of pollutants to the waters of the United States from any point source unlawful, unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The CWA, as amended in 1987, directed that storm water discharges are subject to an NPDES permit if the storm water is conveyed through point sources. The 1987 CWA amendment established a framework for regulating municipal and

industrial storm water discharges under the NDPES program. Important CWA sections are as follows:

- Sections 303 and 304 provide for water quality standards, criteria, and guidelines.

- Section 401 requires an applicant for any federal project that proposes an activity, which may result in a discharge to waters of the United States, to obtain certification from the State that the discharge will comply with water quality standards established by the state. .

- Section 402 establishes the NPDES, a permitting system for the discharges (except for dredge or fill material) into waters of the United States. Regional Water Quality Control Boards (RWQCBs) administer this permitting program in California. Section 402(p) addresses storm water and non-storm water discharges.

- Section 404 establishes a permit program for the discharge of dredge, or fill material into waters of the United States. This permit program is administered by the U.S. Army Corps of Engineers (ACOE).

The objective of the CWA is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

State Requirements: Porter-Cologne Water Quality Control Act (California Water Code)

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 otherwise) to land or surface waters that may impair beneficial uses for surface and/or groundwater of the state.

The State Water Resources Control Board (SWRCB) and RWQCBs are responsible for establishing the water quality standards , a combination of beneficial uses and water quality objectives as required by the CWA, and regulating discharges to ensure that the water quality standards are met. States designate beneficial uses for all water body segments, 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. Details regarding water quality standards in a project area are contained in the applicable RWQCB Basin Plan. In addition, each state identifies waters failing to meet standards for specific pollutants, which are 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 controls, the CWA requires establishing Total Maximum Daily Loads (TMDLs). TMDLs

establish allowable pollutant loads from all sources (point, non-point, and natural) for a given watershed.

State Water Resources Control Board and Regional Water Quality Control Boards

The SWRCB administers water rights, water pollution control, and water quality functions throughout the state. RWCQBs are responsible for protecting beneficial uses of water resources within their regional jurisdiction using planning, permitting, and enforcement authorities to meet this responsibility.

- **MS4 NPDES Program**

  The SWRCB adopted Caltrans Statewide Municipal Separate Storm Sewer System (MS4) NPDES Permit (Order No. 99-06-DWQ) on July 15, 1999. This permit was a Phase I permit and covers all Department rights-of-way, properties, facilities, and activities in the State. The U.S. EPA defines a Municipal Separate Storm Sewer System (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, country, or other public body having jurisdiction over storm water, that are designed or used for collecting or conveying storm water. NPDES permits establish a 5-year permitting time frame. NPDES permit requirements remain active until a new permit has been adopted. The technology-based effluent limitation standard for all MS4 NPDES permits is Maximum Extent Practicable.

  In compliance with the permit, the Department developed the Statewide Storm Water Management Plan (SWMP) to address storm water pollution controls related to highway planning, design, construction, operation and maintenance activities throughout California. The SWMP describes the minimum procedures and practices the Department uses to reduce pollutants in storm water and non-storm water discharges. It outlines procedures and responsibilities for protecting water quality, including the selection and implementation of Best Management Practices (BMPs) to reduce, control and treat (if necessary) storm water runoff to the Maximum Extent Practicable. The proposed Project will be programmed to follow the guidelines and procedures outlined in the 2003 SWMP to address storm water runoff or any subsequent SWMP version draft and approved.

- **Construction Activity Permitting**

  Section H.2, Construction Program Management of the Department's MS4 NPDES permit states: "The Construction Management Program shall be in compliance with requirement of the NPDES General Permit for Construction Activities (Construction General Permit)". Construction General Permit (Order No. 2009-009-DWQ, adopted

on September 2, 2009, will become effective on July 1, 2010. The permit will regulate storm water discharges from construction sites that result in a DSA of 1 acre or greater, and/or are part of a common plan of development. By law, all storm water discharges associated with construction activity where clearing, grading, and excavation results in soil disturbance of at least 1 acre must comply with the provisions of the General Construction Permit.

The newly adopted permit separates projects into Risk Levels 1 – 3. Requirements apply according to the Risk Level determined. For example, a Risk Level 3 (highest risk) project would require compulsory storm water runoff pH and turbidity monitoring. Risk levels are determined during the design phase and are based on potential erosion and transport to receiving waters. Applicants are required to develop and implement an effective Storm Water Pollution Prevention Plan (SWPP). Caltrans Statewide NPDES Permit requires the Department to submit a Notice of Construction (NOC) to the RWCB to obtain coverage under the Construction General Permit. Upon project completion, a Notice of Completion of Construction (NOCC) is required to suspend coverage. This process will continue to apply to Department projects until a new Caltrans Statewide MS4 NPDES Permit is adopted by the SWRCB. An NOC or equivalent form will be submitted to the RWQCB at least 30 days prior to construction if the associated DSA is 1 acre or more. In accordance with the Department's Standard Specifications, a Water Pollution Control Plan (WPCP) is used for projects with DSA less than 1-acre.

During the construction phase, compliance with the 2009 CGP and the Department's Standard Special Conditions requires appropriate selection and deployment of both structural and non-structural BMPs. These BMPs must achieve technology-based effluent limitation standards for industrial/construction activities. Those are Best Available Technology economically achievable (BAT) for toxic pollutants and Best Conventional Pollutant Control Technology (BCT) for conventional pollutants to reduce or eliminate storm water pollution.

3.1 Water Quality Objectives and Beneficial Uses

The proposed project is located within the jurisdiction of the Central Valley RWQCB (Region 5). The RWQCB has adopted the Water Quality Control Plan (Basin Plan) for the Central Valley Region - The Sacramento-San Joaquin Delta Basin - The San Joaquin River Basin - Fourth Edition 1998.

These water quality standards, consisting of beneficial uses and water quality objectives, are listed in the Central Valley RWQCB Basin Plan. Designated Beneficial uses listed in the Basin Plan for the Merced River from its source to McClure Lake (Upper Merced River) are: irrigation, industrial power, contact recreation, canoeing and rafting and other non-contact recreation, warm and cold freshwater habitat, and wildlife habitat. Water

quality objectives consist of both narrative and numerical goals, and are established to preserve the designated beneficial uses of regional water bodies. The water quality objectives must comply with the Federal Anti Degradation Policy. This policy requires the Central Valley RWQCB to maintain beneficial uses existing in 1975 or best quality since then as the baseline.

The Upper Merced River is not presently designated as high quality (Tier 2) water and is not subject to the State Anti-Degradation Policy (SWRCB Resolution 68-16). Should municipal or domestic use become a probable future beneficial use, the Upper Merced River could be designated a Tier 2 water and be entitled to a more protective status under Resolution 68-16.

Unless otherwise determined by the Central Valley RWQCB, all groundwater resources have four potential or existing beneficial uses. These uses include municipal or domestic supply, agricultural supply, industrial service supply, and industrial process supply.

4.0 AFFECTED ENVIRONMENT

The quality of water in an area depends upon several factors, including land use, topography, geology, soils, surface and groundwater hydrology, and climate. Following is a brief description of these general characteristics in the project area and surroundings.

4.1 Land Use

Current land use was identified using Mariposa County's 2003 General Plan. More than half of the land within Mariposa County is federally owned. The project area lies entirely within the Sierra National Forest. The Bureau of Land Management also owns segments of land, including one near the project area in El Portal.

The land within the project area is considered rural and is managed by the U.S. Forest Service. There are no residences or businesses within the limits of the proposed project.

4.2 Topography/Geology/Soils

The Ferguson rockslide is located approximately 6 miles west of El Portal on the west side of the Merced River and SR 140. The study area is in the Sierra Nevada/foothills metamorphic belt. The geology of the Sierra Nevada Range in the area consists of mainly igneous and metamorphic rocks of diverse composition and age, including volcanics and meta-sedimentary interlayered rocks.

The site is underlain by metamorphic bedrock that has been mapped as the Phyllite and Chert of Hite Cove meta-sedimentary unit of the Permian – Triassic Calaveras Complex.

Sand and gravel bars are present in the Merced River channel, predominantly on the north side. In some places, the bedrock is exposed at the surface. At other locations, such as the slopes, the bedrock is covered with a thin layer of soil and angular pieces of rock called colluvium. The river channel is made of alluvium, which is composed of rounded cobbles and boulders.

The section of the highway within the project limits is located in the steep and narrow Merced River Canyon. The river is at approximately elevation 1500 feet and the top of Ferguson Ridge is at approximately elevation 3000 feet. The slope angles in the canyon range from 40° to 45°. The southwest-facing hillsides are covered with grass and scattered oaks and pines. The northeast-facing hillsides are covered with dense chaparral and scattered oaks and pines. The slopes are covered with a thin soil layer, probably less than 5 feet thick in most places. A thin layer of alluvium (sand, gravel, cobbles and boulders), probably less than 15 feet in most places, covers most of the river channel. Very hard, fractured metamorphic rock underlies the soil and alluvium.

4.3 Climate

The climate of the San Joaquin River Basin is semi-arid, characterized by hot, dry summers and mild winters, except at the highest altitudes, where distinct wet and dry seasons prevail. Most of the precipitation falls from November to April, with rain at the lower elevations and snow in higher regions.

4.4 Water Resources

This section deals with the surface water and groundwater present in the area, and discusses its quality from both regional and project level perspectives.

4.4.1 Surface Water

The project is located within the North Fork Merced Hydraulic Area (HA 537.30) of the Merced River Hydrologic Unit. The watershed is 160,784 acres with an annual rainfall of 41.9 inches. The main stem Merced River flows 20 miles downstream from the project where it is dammed, forming McClure Lake.

The major water body is the Merced River. The Merced River originates in the High Sierra of Yosemite National Park. The river collects its water from Mount Hoffman, Mount Raymond, Tenaya Lake, and the Cathedral Range and flows freely into Yosemite Valley. The Merced River creates deep canyons as it continues through the Sierra and Stanislaus national forests. The river eventually makes its way down into the San Joaquin Valley. The Merced River has two major branches. The main river branch goes through Yosemite Valley. The South Fork branch starts at the southern end of Yosemite and flows through some of the wildest and least developed land in

the Sierra National Forest before it joins the main branch just upstream of the Ferguson rockslide. The Merced River is listed as a Wild and Scenic River and classified for recreation

The water quality within Merced River in the vicinity of the project is good to excellent, and no segments are listed as impaired on the 303(d) list

4.4.2 Groundwater

This site is located within the Yosemite Valley Groundwater Basin # 5-69 in Mariposa County. The Basin lies beneath the floor of Yosemite Valley at an approximate elevation of 4,000feet in the central Sierra Nevada. Steep walls carved out of the surrounding granitic/metamorphic rocks surround the valley. These tributaries flow into the Merced River, which drains the valley to the west.

Recharge to the shallow aquifer occurs through percolation of direct precipitation and from the Merced River. Deeper zone recharge beneath the confining layers may occur from infiltration through coarse material along the valley margins.

Groundwater is of very good quality with TDS ranging from 43 to 73 mg/L. The groundwater is suitable for all uses and no impairments are known (DHS 1989).

5.0 WATER QUALITY IMPACTS

The scope of the project involves doing construction work directly in the bed of the main stem Merced River. The proposed project has the potential of having short term and long term water quality impacts. Based on the highway storm water runoff data collected by the Caltrans Storm Water Research and Monitoring Program, typical pollutants from caltrans highways include heavy metals, oil and grease, sediment, and litter.

5.1 SHORT-TERM WATER QUALITY IMPACTS

Potential short-term water quality impacts would be primarily associated with erosion of exposed or disturbed soils and pollutants entering Merced River due to construction activities. Construction of the proposed project would cause disturbances to the ground surface from earthwork. This would potentially increase the amount of sediments entering into Merced River. Runoff during the winter season is of greater concern due to the potential erosion of unprotected or graded surfaces. Sediments suspended in runoff could be carried downstream, where, if not controlled, could accumulate in downstream watercourses, potentially harming any downstream aquatic resources and water quality. Materials used during construction (e.g., concrete curing compounds) may have chemicals that are potentially harmful to aquatic resources and water quality. Accidents or improper use of these materials could release contaminants to the environment. Additionally, oil and

other petroleum products used to maintain and operate construction equipment could be accidentally released.

To prevent the release of these compounds, mitigation measures and Best Management Practices (BMP) have been provided to minimize any potential impacts. Implementation of BMPs and compliance with the CGP's substantive requirements should reduce short-term impacts to water resources.

Surface water in terms of stormwater runoff generated from the project is proposed to be discharged to unlined channels. The watershed area is 16078 acres, and the net impervious area of any single proposed alternative is no more than 3 acres. The volume of stormwater generated from this project compared to the stormwater generated in the entire watershed is less than 1 percent. After evaporation, net recharge to the groundwater basin would be insignificant compared to the recharge from the Merced River and precipitation over entire watershed. The quality of groundwater in Mariposa County varies in relation to proximity to location(s) of groundwater recharge areas, quality of water being recharged into the water table, proximity of groundwater to non-point and/or point sources, and the geologic strata. The recharge area of the stormwater runoff from the project is not located in an urban setting, and no additional source of pollutants are known other than the typical highway pollutants. For this project short-term and long term water quality impacts to the groundwater via recharge will be minimum, and insignificant.

5.2 LONG-TERM WATER QUALITY IMPACTS

Potential long-term water quality impacts associated with bridge replacement projects occur from pollutants entering a water body via storm water runoff. Impacts can also occur from increases in storm water runoff. Storm water runoff rates can be increased from the addition of impervious roadway surface areas, modifications of design features in the channel, and alterations to stream morphology and hydraulics.

- **Highway Pollutants**: Increased pollutant discharges from the road surface during storm events, including oil, trash, dust, brake linings, hazardous materials spills during traffic accidents, and illegal dumping.
- **Erosion/Sediment**: Wherever concentrated flow from the highway surface cannot be adequately controlled, erosion may occur. Erosion from concentrated flow can cause gullies, alter stream geomorphology, and discharge sediment above background levels to waterways.

The build alternatives C, T and S would place two bridges within the bed and banks of the Merced River. The design of the upstream bridge will slightly change the speed and force of the river's flow from its natural conditions (estimated to be 1 to 1.5 feet per second). The downstream bridge would not affect the movement of the sediments. For the proposed

alternatives, S2V1, and S2V2,the bridge piers would be constructed above the Q2 or active bankfull river channel. Alternatives R, and T-3 will not have any direct construction in the river bed and will have no adverse water quality impacts.

Incline Road and the abandoned existing State Route 140 would be restored to natural conditions as the pavement would be removed. Table 1 shows the baseline impervious area, the net impervious area, and runoff volumes.

The No-build Alternative would only produce minor changes in the flow velocity of the river, with slightly higher flow rates in the center of the channel just below the downstream bridge and at the center pier of the upstream bridge. Since the change in flow velocity is minimal, the potential for the river to move sediment is generally unchanged from the river in its natural condition

Table 1 Estimated Runoff for Various Alternatives

Proposed Alternatives	Baseline Impervious Area in Acres	Net Impervious Area in Acres	Baseline Stormwater Runoff (cubic feet per second)	Future Runoff (Cubic Feet Per Second)	Runoff for Entire Watershed (Cubic Feet Per Second)
Alternative c	1.10	2.23	0.68	1.376	337640
Alternative T	1.10	2.23	0.68	1.376	337640
Alternative S	1.10	2.83	0.68	1.74	337640
Alternative S2-V1	1.10	1.90	0.68	1.17	337640
Alternative S2-V2	1.10	1.90	0.68	1.17	337640
Alternative T3	1.10	2.42	0.68	1.49	337640
Temporary Bridge, and inclined Road	1.10	0	0.68	0.68	337640
No-Build Alternative Built, and inclined Road	1.10	0	0.68	0.68	337640

Note: The stormwater flows are estimated based on the Rational Method (Q=CiA)
Where Q = the peak discharge (cfs) from a given area.
C= a coefficient relating the runoff to rainfall.
i = average rainfall intensity (inches/hour)
A = drainage area (acres)

For this project rainfall intensity for a 10 year/1 hour storm event was utilized.

The stormwater runoff from the proposed bridges would be discharged into unlined channels, and not directly in to the Merced River. The estimated runoff flows estimated from the net impervious area in future are approximately double than the current baseline flows, however, compared to the runoff from the entire watershed the numbers are very low. The main constituents of concern in the stormwater as described above are highway pollutants, and sediments/erosion. The controlled discharge to unlined channels along with BMP's would minimize any adverse impacts of the stormwater to water quality. As such the projects proposed alternatives would not violate existing water quality standards or waste discharge requirements. The unlined channels proposed for this project would be designed to handle the stormwater runoff

Other potential impacts like streambed erosion and increased sediment load would be minimal. Caltrans Location Hydraulic study has determined that the implementation of the proposed alternatives would not substantially alter the existing drainage pattern that might result in substantial erosion/sediment that might have adverse impacts on water quality.

6.0 AVOIDANCE and MINIMIZATION MEASURES

The Water Quality Assessment of the project has determined that short- and long-term impacts to the quality of water resources of the area might occur during construction of the project, and subsequent operation and maintenance of the alternatives. Implementation of the project will require construction activities within the normal flow path of the Merced River. Management measures in the form of a Stormwater Pollution Prevention Plan (SWPPP), design pollution prevention BMPs, construction site (temporary) BMPs, and Maintenance BMPs are required to address water quality impacts during planning, design, construction, and operational and maintenance stages.

Important avoidance and minimization measures during construction for roads, highways, and bridges include:

- Work within the stream bed of Merced River would be limited to the period between April 15 and October 15 to avoid the rainy season.
- Prior to work in or near Merced River, coffer dams, culverts, and/or other temporary water diversion features will be installed to reduce sedimentation during construction; diverted or impounded water will not be discharged into the stream prior to treatment to remove sediment.
- Land disturbing activities and the installation of erosion and sedimentation control practices shall be coordinated to reduce on-site erosion and off-site sedimentation. These measures may include mulches (above the mean high water line only), soil binders and erosion control blankets, silt fencing, fiber rolls, sediment desilting basins, sediment traps, and check dams.

- The area of construction and disturbance would be limited to as small an area as feasible.
- Loose bulk materials may be applied to the soil surface as a temporary cover to protect bare soils from rainfall impact, increase infiltration, and reduce runoff and erosion.
- Stabilizing material, such as water, shall be applied to the soil surface to prevent the movement of dust at the Project site due to traffic, wind, and grading activities.
- All areas shall be restored to pre-construction contours and revegetated with native species. Hydroseeding would be implemented as a temporary measure, if feasible.
- Provide berms along the tops of slopes to prevent water from running uncontrolled down the slopes.
- Collect the water in these berms and take it down the slopes in an erosion-proof drainage system. Sediment that is collected within these berms would be allowed to "settle out" and would be removed from the site.
- Provide energy dissipaters and erosion control pads at the bottom of slope drains. Other flow conveyance control mechanisms may include earth dikes, swales, or ditches. Stream bank stabilization measures should also be implemented.
- All construction related materials would be hauled off-site after completion of construction.
- All erosion control measures and storm water control measures would be properly maintained until the site has returned to a pre-construction state.
- All construction roadway areas would be properly protected to prevent excess erosion, sedimentation, and water pollution.
- All vehicle and equipment maintenance procedures would be conducted off-site. In the event of an emergency, maintenance would occur away from the stream channel.
- All concrete curing activities would be conducted to minimize spray drift and prevent curing compounds from entering the waterway directly or indirectly.
- All construction materials, vehicles, stockpiles, and staging areas would be situated outside of the stream channel as feasible. All stockpiles would be covered, as feasible.

Caltrans provides the following summarized guidance and recommendations for drainage systems: Storm water runoff systems should promote sheet flow through vegetation, utilize open vegetated channels and conveyances, and minimize curb, dike, and pipe. The following pollution prevention measures are being proposed in the design of this project, which would include stormwater generated from the bridges:

- Culverts would discharge surface runoff from the project to unlined channels. To minimize scour (erosion), check dams, drainage inlets, and energy dissipation systems would be incorporated into the drainage design.
- Flared end sections and energy dissipation devices would be constructed at all culvert outlets.

- All ditches would be stabilized with erosion control. The newly constructed slopes would be stabilized with erosion control.

As stated above the main constituents of concern in the stormwater are highway pollutants, and sediments/erosion. With implementation of the BMPs there will be no adverse impacts to water quality from these pollutants.

These BMPs are selected for each individual project during the preparation of the SWPPP. The selection of BMPs depends on site and project specific circumstances and conditions. These BMPs are applied to reduce water quality impacts to the maximum extent practicable (MEP) for MS4 NPDES compliance and best conventional technology and the best available technology (BCT/BAT) during construction activities to comply with the substantive provisions of the CGP. All are aimed to meet Water Quality Standards of the Basin Plan.

Temporary construction BMPs are described in detail in the Construction Site Best Management Practices BMPs Manual (March, 2003), and are summarized in the 2003 SWMP, created pursuant to Caltrans NPDES Permit and submitted by Caltrans to the State Water Resources Control Board and incorporated into the Caltrans permit by reference.

7.0 CONCLUSIONS AND RECOMMENDATION

Water quality assessment of the project has determined that short-term impacts to surface water quality could occur during construction of the project. The primary impacts would occur from discharge of sediments and inorganic and organic pollutants into Merced River during construction activities. Implementing appropriate Best Management Practices (BMPs) during construction can reduce the short-term impacts. Long-term impacts, including a change in erosion patterns and surface water velocity, are anticipated and will be addressed using Design Pollution Prevention Measures and measures to control, reduce and if necessary treat runoff to MEP.

These water quality impacts would not cause or significantly contribute to the exceedance of a water quality standard or waste discharge requirement. The project will not substantially alter the stream hydraulics and create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems, or cause substantial additional sources of polluted runoff.

The proposed alternatives will sustain the existing water quality, maintain the outstanding and remarkable values associated with the recreational functions of the river in the project area and comply with the Federal Anti-Degradation provisions of the CWA.