3.2.2 Water Quality and Stormwater Runoff

Regulatory Setting

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 Federal Water Pollution Control Act was subsequently amended in 1977, and was renamed the Clean Water Act (CWA). The CWA, as amended in 1987, directed that storm water discharges are point source discharges. 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 other provisions of the act.
- 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 (RWQCB) administer this permitting program in California. Section 402(p) establishes 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 (objectives) required by the CWA, and regulating discharges to ensure that the objectives are met. Details regarding water quality standards in a project area are contained in the applicable RWQCB Basin Plan. 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. 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.

NPDES Program

The SWRCB adopted Caltrans Statewide NPDES Permit (Order No. 99-06-DWQ) on July 15, 1999. This permit covers all Department rights-of-way, properties, facilities, and activities in the State. NPDES permits establish a 5-year permitting time frame. NPDES permit requirements remain active until a new permit has been adopted.

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, 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). 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.

Municipal Separate Storm Sewer System Program

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. As part of the NPDES program, U.S. EPA initiated a program requiring that entities having MS4s apply to their local RWQCBs for storm water discharge permits. The program proceeded through two phases. Under Phase I, the program initiated permit requirements for designated municipalities with populations of 100,000 or greater. Phase II expanded the program to municipalities with populations less than 100,000.

Construction Activity Permitting

Section H.2, Construction Program Management of the Department's 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 (SWPPP).

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 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 permit and the Department's Standard Special Conditions requires appropriate selection and deployment of both structural and non-structural BMPs. These BMPs must achieve performance standards of Best Available Technology economically achievable/Best Conventional Pollutant Control Technology (BAT/BCT) to reduce or eliminate storm water pollution.

Affected Environment

The following discussion is based on information taken from the *I-80/I-680/SR-12 Interchange Project, Stormwater Data Report (*SWDR) and *I-80/I-680/SR-12 Interchange Project, Water Quality Report* prepared for the proposed project in 2010.

The project area is within the watersheds of Jameson Creek, Green Valley Creek, Dan Wilson Creek, Suisun Creek, American Canyon Creek, Pennsylvania Avenue Creek, Raines Drain, Alonzo Drain, and Ledgewood Creek. The general topography of the land is gradually sloping to the south towards Suisun Bay, 15 miles downstream. These creeks and drainages cross the project area and discharge to the Suisun Marsh wetlands, which are between 1 and 2 miles downstream. The proposed project is located in the Suisun-Fairfield Valley groundwater basin (basin 2-3). The depth to groundwater ranges from three to 20 feet as reported in the as-built Log of Test Borings from 1950, 1960, and 1970.

The *Water Quality Control Plan for the San Francisco Bay Basin* (basin plan) establishes beneficial uses for waterways and water bodies within the region. Existing beneficial uses for Suisun Creek include freshwater supply, areas of special biological significance, cold freshwater habitat, fish migration, water contact recreation (potential), noncontact water recreation (potential), fish spawning, warm freshwater habitat, and wildlife habitat (San Francisco Bay Regional Water Quality Control Board 2007). Ledgewood Creek is the only other water body with defined beneficial uses in the basin plan. The beneficial uses for Ledgewood Creek are the same as Suisun Creek, with the exception that both contact and noncontact water recreation beneficial uses are existing as opposed to potential (San Francisco Bay Regional Water Quality Control Board 2007).

Section 303(d) of the 1972 CWA states that territories and authorized tribes are required to develop a list of water quality–limited segments that do not meet water quality standards, even after point sources of pollution have the minimum required levels of pollution control technology. The water bodies to which the proposed project discharges are not listed on the EPA's 303(d) List of Water Quality Limited Segments.

Of the named water bodies within the project vicinity, the San Francisco Bay RWQCB lists only the Suisun Marsh wetlands as impaired. Specifically, metal concentrations such as arsenic, cadmium, chromium, copper, lead, nickel, and zinc from urban runoff and storm sewers exceed the targeted design total maximum daily loads (TMDLs). However, the proposed project will not directly drain into the Suisun Marsh and these constituents have low TMDL priority. Farther downstream, the Suisun Bay and Carquinez Strait also contain several CWA Section 303(d)–listed pollutants (organic compounds, polychlorinated biphenyls [PCBs], mercury, selenium, general particulates, dissolved metals, nutrients, and salinity). A 2008 Draft List for TMDLs was adopted by the San Francisco Bay RWCQB in February 2009. When finalized these TMDLs will be required control targets for the project. As construction phases occur, the current TMDL requirements should be identified and met, in addition to consultation with the San Francisco Bay RWCQB.

Based on the highway stormwater runoff data collected by the Department's Storm Water Research and Monitoring Program, pollutants that are expected to be found in runoff from the proposed action include conventional constituents (biochemical oxygen demand [BOD], calcium carbonate [$CaCO_3$], chemical oxygen demand [COD], total dissolved solids [TDS], total organic carbon [TOC], total suspended solids [TSS] and total volatile suspended solids [TVSS], etc.) hydrocarbons, metals, microbial agents, nutrients, volatile organics, semi-volatile organics, pesticides, and herbicides. Pollutants are usually deposited on the roadway as a result of fuel combustion processes, lubrication system losses, tire and brake wear, transportation load losses, paint from infrastructure, and atmospheric fallout. Constituent testing for another project in the area (the I-80 HOV widening project) revealed ADL soils are present within the project's limits. Sources of specific pollutants are outlined in Table 3.2.2-1 below.

Table 3.2.2-1. Known Roadway Pollutants

Constituents	Primary Sources
Particulates	Pavement wear, vehicles, atmosphere, maintenance, snow/ice abrasives, sediment disturbance
Nitrogen, Phosphorus	Atmosphere, roadside fertilizer application, sediments
Lead	Auto exhaust, tire wear, lubricating oil and grease, bearing wear, atmospheric fallout
Zinc	Tire wear, motor oil, grease
Iron	Auto body rust, steel highway structures, moving engine parts
Copper	Metal plating, bearing and bushing wear, moving engine parts, brake lining wear, fungicide and insecticide application
Cadmium	Tire wear, insecticide application
Chromium	Metal plating, moving engine parts, brake lining wear
Nickel	Diesel fuel and gasoline, lubricating oil, metal plating, bushing wear, brake lining wear, asphalt paving
Manganese	Moving engine parts
Bromide	Exhaust
Cyanide	Anticake compound used to keep deicing salt granular

Constituents	Primary Sources
Sodium, Calcium	Deicing salts, grease
Chloride	Deicing salts
Sulphate	Roadway bed, fuel, deicing salts
Petroleum	Spills, leaks or blow-by of motor lubricants, antifreeze and hydraulic fluids, asphalt leachate
PCBs, Pesticides	Spraying of highway rights-of-way, atmospheric deposition, PCB catalyst in synthetic tires
Pathogenic bacteria	Soil litter, bird droppings, trucks hauling livestock/stockyard waste
Rubber	Tire wear
Asbestos[a]	Clutch and brake lining wear

Source: Federal Highway Administration 1996.

[a] No mineral asbestos has been identified in runoff; however some breakdown products of asbestos have been measured.

Soils information for the project area has been obtained from the related project geotechnical reports and the U.S. Department of Agriculture, National Resource Conservation Service. The soils within the project limits are as described in Table 3.2.2-2 below.

Table 3.2.2-2. Soils in the Project Area

Map Unit Name	Map Unit Symbol	Hydrological Soil Group
Sycamore silty clay loam	(Sr)	D
Yolo Silty clay loam	(Ys)	D
Sycamore silty clay loam	(Sr)	D
Sycamore silty clay loam drained	(Ss)	D
Sycamore silty clay loam	(Sr)	D
Antioch-San Ysidro Complex, 0-2 percent slopes	(AoA)	
Brentwood clay loam, 0-2 percent slopes	(BrA)	D
Antioch-San Ysidro Complex, thick surface, 0-2 percent slopes	(AsA)	
Pescadero clay	(Pe)	D
Clear Lake clay, 0-2 percent slopes	(CeA)	D

Hydrological Group D soils have the highest runoff potential, very low infiltration rates when thoroughly wetted, and may be subject to erosion by water.

Environmental Consequences

Increased Runoff and Associated Operational Water Quality Issues

Implementation of both alternatives would involve significant mainline and interchange improvements. The general drainage design is to collect and convey pavement runoff while not conveying runoff within the travelled way. Once collected from the pavement or graded areas, runoff will be conveyed in non-erosive culverts, ditches, or swales to an existing waterway that currently receives highway runoff. The project alternatives would increase the amount of stormwater runoff within the state right-of-way by increasing the total impervious surface. The approximate acreage of impervious surface for each of the project alternatives is summarized in Table 3.2.2-3 below.

Table 3.2.2-3. Acreage of Impervious Surfaces

Alternative	New Impervious	Reworked
B	128.2 acres	251.7 acres
C	123.2 acres	219.9 acres
B-1	27.8 acres	71.4 acres
C-1	51.9 acres	90.1 acres

Increased runoff and operation water quality issues are integral to projects with new or reconstructed impervious surfaces. Increased impervious surfaces result in increased stormwater runoff which could lead to additional pollutants entering waterways. The project alternatives will incorporate approved permanent stormwater treatment BMPs to minimize potential water quality impacts. The exact amount of new or reconstructed pavement tributary to each waterway for each project alternative has not been determined at this phase of the project.

Effects on the receiving water bodies would be the result of capacity changes to the hydraulic features of the drainage system. To manage the stormwater runoff the on-site drainage facilities would be reconfigured within the proposed right-of-way as part of the project design. Additionally, stable cavities discussed in Section 3.2.1 would reduce the potential of flooding and, therefore, the potential for resulting water quality issues. Therefore, the associated watersheds would be only minimally affected from the additional stormwater runoff from the increase in impervious surface.

Stable cavities are meant to be spaces, vaults, or other below ground storage devices, for storm runoff intended to mitigate for lost floodplain storage. The cavities will not impact the groundwater because they are intended to be placed at or above the existing ground elevation within the new fill for the westbound truck sales.

Both project alternatives have very similar water quality issues. The magnitude of the issues is very similar with both alternatives covering an area of approximately 350 acres of new or reworked pavement plus over 100 acres of graded surfaces. The footprint for both of these alternatives is substantially the same with no conditions or issues unique to either alternative.

Likewise, under the fundable first phase of either alternative, there would also be increased runoff and associated water quality issues. However the magnitude of runoff impacts for the fundable first phases of both alternatives are significantly reduced due to the smaller project footprints (100 acres of total new or reworked pavement for Alternative B, Phase 1, and 140 acres of total new or reworked pavement for Alternative C, Phase 1) compared to the full build alternatives.

All of the waterways in the project area are included in three hydrologic sub-areas 207.21, 207.22 and 207.23 as defined by the State Water Board. None of these hydrologic sub-areas currently have defined TMDL listings. (A draft TMDL listing dated 2008, not yet approved, lists Suisun Creek with dissolved oxygen and temperature, and Ledgewood Creek with diazinon.) At the downstream end of these three watersheds is the Suisun Marsh Wetlands for which there are Targeted Design Constituents of metals and nutrients. The proposed permanent treatment BMPs such as bioswales, biostrips, and infiltration devices will be effective for metals and nutrient uptake, minimizing the project impacts of these constituents (and others) to the receiving waters

and the Suisun Marsh Wetlands. Treatment BMPs are included in all alternative layouts to manage all possible pavement runoff.

Discussions of other water quality issues are included in Section 3.2.1 (Hydrology and Floodplain), Section 3.2.5 (Hazardous Waste/Material), Section 3.3.2 (Wetlands and other Waters), the discussions of fish species in Section 3.3.4 (Animal Species) and Section 3.3.5 (Threatened and Endangered Species) and other sections within this document. Refer to Chapter 4, CEQA Evaluation, for discussion of non-jurisdictional perennial marsh, and non-jurisdictional seasonal wetland.

There would be no increase in pavement under the No-Build Alternative and therefore no potential to increase runoff and associated water quality issues.

According to the Department's NPDES permit and the Construction General Permit, best management practices (BMPs) will be incorporated into the proposed project to reduce the discharge of pollutants during construction and operation to the maximum extent practicable. These BMPs fall into three categories: temporary construction site BMPs, design pollution prevention BMPs, and permanent treatment BMPs. Temporary construction site BMPs are discussed below under construction impacts.

Permanent Design Pollution Prevention BMPs

Slope/Surface Protection Systems

To minimize erosion from any of the new slopes, mitigating design features have been considered, including minimizing cut-and-fill slopes, shaping slopes to reduce concentrated flow, and collecting concentrated flows in stabilized channels. All graded slopes, either cut or fill, will be constructed with proper erosion control and permanent plantings. Except at bridges, no retaining walls are anticipated.

Certain areas of the project alternatives would be hardscaped as required for safety (ramp gores), maintenance (pullout areas), and slope stability (under bridges).

Construction of the project alternatives would remove moderate amounts of vegetation within the project right-of-way. In many locations, the project alternatives would replace existing unpaved areas with pavement or impervious structures. At all areas where new slopes are constructed, proper vegetation will be planted, monitored, and maintained to establish permanent cover. Approval of the erosion control plan by the Department's Division of Design, Landscape Architecture will occur during final design.

To minimize erosion potential, slopes will be rounded and or shaped to reduce concentrated flows, concentrated flows will be collected in stabilized drains or channels, slopes will be 1:4 or flatter and those greater than 1:2 will have an erosion control plan approved by the district landscape architect according to the project Geotechnical Design Report.

Given the characteristics of the in-situ soils, there are some slope stability concerns on this site. Slope and surface protection systems will be incorporated per Checklist DPP-1, Part 3. To minimize erosion from any of the slopes the methods being considered include:

- Minimizing cut and fill slopes,
- Shaping slopes to reduce concentrated flow, and
- Collecting concentrated flows in stabilized channels.

Concentrated Flow Conveyance Systems

Concentrated flow conveyance systems are used to collect, transport, convey, and/or dissipate stormwater flows. A variety of concentrated flow conveyance devices exist along the length of the proposed project. Along most of the existing reach of the highway, runoff sheet-flows off of the pavement, crossing several feet of vegetated strips before entering a swale oriented longitudinally to the right-of-way. The existing concentrated flow conveyance devices include lined and unlined ditches and swales, drainage inlets and culverts, asphalt concrete (AC) dikes and overside drains, flared end sections, rock slope protection (RSP) pads, flow energy dissipation devices, and other approved drainage design devices. For the proposed project, the planned drainage pattern will replicate as much as possible the existing runoff pattern. The drainage improvements will direct pavement runoff to sheet flow to the outside edge of the new pavement where improved drainage devices will collect and convey the project runoff.

Preservation of Existing Vegetation

One goal of the project alternatives and construction activities is to preserve areas of existing vegetation wherever possible. Preserving existing vegetation is essential in the protection of water quality due to the elevated chances of cleared areas increasing erosion and sedimentation to waterways. At all areas where existing vegetation (on land to remain) is affected, or where new slopes are constructed, proper vegetation will be placed, monitored, and maintained to establish permanent cover. For those areas on the outside of the highway, pavement will be minimized in favor of retaining existing vegetative cover. In many locations the proposed project will replace existing unpaved areas with impervious surface. Approval of the erosion control plan by a landscape architecture and maintenance plan will occur in final design.

Bridge construction will take place at all seven water crossings that are ESAs. ESAs exist at other project locations as well and are potentially affected by the proposed project.

Permanent Treatment BMPs

Because the project alternatives are considered a major reconstruction project, they are not exempt from incorporating treatment BMPs. Treatment BMPs are permanent devices and facilities that will store and treat increased stormwater runoff expected with operation of the project alternatives in an effort to preserve water quality and reduce the potential for flooding. The Department's approved treatment BMPs are biofiltration swales, infiltration basins, detention basins, traction sand traps, dry weather flow diversions, media filters, gross solids removal devices (GSRDs), multi-chamber treatment trains, and wet basins. Those most feasible in the Bay Area are biofiltration swales, infiltration basins, detention basins, media filters, multi-chamber treatment trains, and wet basins.

Because of potential high groundwater within the project area, infiltration and detention basins would not be feasible. As such, biofiltration swales and biostrips have been investigated as possible alternatives. Both treatment BMPs treat the same types of constituents: TSS, particulate metals, and litter. Both biofiltration swales and strips are viable cost-effective treatment BMPs.

Because of the limited permeability of the soils and potentially high groundwater, infiltration devices and other filters allowing percolation of stormwater back into the ground are not a consideration. However, engineered biofiltration strips and swales are proposed. Biofiltration strips and swales are effective at trapping litter, TSS, and particulate metals. Where possible, it is recommended that the existing vegetation be evaluated for use as effective biostrip cover, or the proposed project should establish the proper vegetative cover and/or swale dimensions at each treatment location.

Locations within the project limits (primarily in the area between the toe of fill slopes and the right-of-way) are available to be used for permanent treatment BMPs. Plans developed at a later stage in design will be more specific in their location, size, vegetative characteristics, and performance measures.

Biofiltration Swales/Strips

Due to the flat topography of the project area, biofiltration would be the primary treatment option for stormwater runoff. Preliminary plans provided in the SWDR identify all potential BMP locations. Exact locations will be determined during final project design. Biostrips would be designed to provide the maximum water quality treatment time of stormwater. The tributary area to the biostrips is the length of pavement from the highway median to the outside edge of pavement. Bioswales would be designed according to the Department's guidance documents, to ensure maximum treatment of water. Additional right-of-way for the project improvements and treatment BMPs has been identified and is included on the project layout sheets included in the SWDR.

Dry Weather Diversion

Dry weather flow diversion BMPs were dropped from further considered for the proposed project because there is no dry weather flow.

Infiltration Devices

Infiltration device BMPs are not feasible for the project alternatives for the following reasons:

- Through much of the project area, the groundwater is too high.
- Most of the soils are Hydraulic Soil Group C or D, limiting the usefulness of infiltration.
- A gravity outlet cannot be created because of the flat terrain.
- There is no room within the right-of-way along most of the project area.
- Areas beyond the right-of-way are mostly prime farmland under cultivation.

Detention Devices
Detention basin BMPs are not feasible for the project alternatives for the following three reasons:

- There is not enough hydraulic head available for proper design.
- There are several locations where the groundwater is high.
- Along most of the project area, there are significant constraints on acquiring new right-of-way, with areas beyond the existing right-of-way consisting mostly of prime farmland under cultivation.

Detention as a treatment device may have negative hydraulic impacts because the project alternatives are located far downstream in the watershed, and detaining the peak runoff from the tributary shed may increase the peak runoff from the entire shed. If hydromodification control is a requirement of the approved project alternative, then detention facilities can be designed for that mitigation, but they would not specifically function as treatment for the reasons stated.

Gross Solids Removal Devices
Litter is not on the 303(d) list or identified as a TMDL for the water bodies near the project area; therefore, GSRDs are not incorporated.

Traction Sand Traps
Traction sand trap BMPs are not appropriate for the project alternatives because traction sand is not applied within the project limits.

Media Filters
Media filter BMPs are not feasible for the project alternatives for the primary reason that the seasonally high groundwater table is likely to be too close to the invert of the filter. Depending on the specific location within the project limits, there are two other reasons that media filters are not an appropriate consideration: 1) there is not enough hydraulic head available for proper design, and 2) along most of the project area, there is no room within the right-of-way, and areas beyond the right-of-way are completely developed.

Multi-Chambered Treatment Trains
Multi-chambered treatment train BMPs are used to treat stormwater in critical source areas. Critical source areas are more common in urbanized environments and are established to facilitate the treatment stormwater runoff in particularly vulnerable or polluted areas. The project alternatives are not considered to be located in a critical source area.

Wet Basins
Wet basin BMPs are not feasible for the project alternatives for the following reasons:

- There is not enough hydraulic head available for proper design.
- There are several locations where the groundwater is high along much of the project area.
- There is limited ability to purchase additional right-of-way, and areas beyond the right-of-way are largely developed.

- Along most of the project area, there is no permanent source of water available to maintain a permanent wet pool.

Maintenance BMPs (Drain Inlet Stenciling)
Nearly all the improvements under both alternatives are located within the highway right-of-way. However, no drain inlet stenciling is necessary for these inlets. At locations where ramp termini meet local streets where pedestrian access is possible, inlet stenciling will be placed on inlets. This stenciling will inform the public that no dumping is allowed and will help protect water quality.

Hydromodification Control
All state or local transportation projects and some non-transportation projects must incorporate hydromodification measures to ensure that hydraulics and flooding are not affected by the new construction.

Potential Water Quality, Erosion and Sediment Control Issues during Construction

Disturbed soil could cause potential erosion and sediment control issues during the construction of all build alternatives. During the storm season, disturbed soil is exposed and can erode into rills and transport sediment to waterways.

Construction of the project alternatives would involve the use of construction equipment and associated fuels, solvents, lubricants, and other pollutants. These substances may be released into the environment during construction and could result in adverse effects to water quality.

Proper erosion and sediment control measures would be effective because of the relatively flat terrain and low grading heights. Preparing and implementing a SWPPP and implementing best management practices would reduce the severity of this effect.

Under the fundable first phases, there would also be potential water quality, erosion, and sediment control issues, however, to a lesser extent because the project footprints are not as large.

The follow construction site BMPs will be in place during construction.

Construction Site BMPs
Construction site BMPs would be applied during construction activities to reduce the pollutants in the stormwater discharges throughout construction. Temporary construction BMPs included in the Department's *Storm Water Quality Handbook* will be included in the SWPPP. Such BMPs may include the following:

- Hydraulic mulch.
- Hydroseeding.
- Soil binders.
- Silt fence.

- Sediment traps.
- Sand bags.
- Fiber rolls.
- Straw bale barrier.

One critical construction activity, dewatering, may be necessary for the proposed project because of the high groundwater levels. Early discussion will be initiated regarding the handling and disposal of this water during the design phase. A project-specific Low Threat Discharge and Dewatering NPDES permit that would contain Waste Discharge Requirements to ensure that the groundwater meets or exceeds water quality standards prior to discharge may be required from the RWQCB if substantial dewatering is to be done.

It is anticipated that dewatering will need to occur at all bridge locations involved in the chosen project alternative. A Notice of Intent shall be submitted and a NPDES Low Threat Discharge and Dewatering Permit obtained from the San Francisco Bay RWQCB prior to any dewatering.

At this phase of the project development process, no specific coordination with the Department's Division of Construction has occurred for the stormwater management issues.

Potential to Require Dewatering during Construction

According to the SWDR for the project, groundwater levels in the project area range from three feet to 18 feet below ground surface. As such, groundwater may be encountered during structure excavations. Proper handling, treatment, and discharge of groundwater would be performed as necessary. It is anticipated that dewatering of groundwater would need to be done at all bridge locations involved in the chosen project alternative. Groundwater in the general area is used for local domestic and agricultural use. Quality is generally good with typically minimal treatment.

There would be no construction under the No-Build Alternative and therefore no potential to require dewatering.

Avoidance, Minimization, and/or Mitigation Measures

With implementation of BMPs no avoidance, minimization or mitigation measures would be necessary.

3.2.3 Geology/Soils/Seismic/Topography

Regulatory Setting

For geologic and topographic features, the key federal law is the Historic Sites Act of 1935, which establishes a national registry of natural landmarks and protects "outstanding examples of major geological features." Topographic and geologic features are also protected under CEQA.

This section also discusses geology, soils, and seismic concerns as they relate to public safety and project design. Earthquakes are prime considerations in the design and retrofit of structures. The Department's Office of Earthquake Engineering is responsible for assessing the seismic hazard for Department projects. The current policy is to use the anticipated Maximum Credible Earthquake (MCE) from young faults in and near California. The MCE is defined as the largest earthquake that can be expected to occur on a fault over a particular period of time.

State Standards

Alquist-Priolo Earthquake Fault Zoning Act

California's Alquist-Priolo Act (PRC 2621 et seq.), originally enacted in 1972 as the Alquist-Priolo Special Studies Zones Act and renamed in 1994, is intended to reduce the risk to life and property from surface fault rupture during earthquakes. The Alquist-Priolo Act prohibits the location of most types of structures intended for human occupancy across the traces of active faults and strictly regulates construction in the corridors along active faults (Earthquake Fault Zones). It also defines criteria for identifying active faults, giving legal weight to terms such as *active*, and establishes a process for reviewing building proposals in and adjacent to Earthquake Fault Zones.

Under the Alquist-Priolo Act, faults are zoned, and construction along or across them is strictly regulated if they are *sufficiently active* and *well-defined*. A fault is considered sufficiently active if one or more of its segments or strands shows evidence of surface displacement during Holocene time (defined for the purposes of the act as within the last 11,000 years). A fault is considered well-defined if its trace can be clearly identified by a trained geologist at the ground surface or in the shallow subsurface, using standard professional techniques, criteria, and judgment (Hart and Bryant 1997).

Seismic Hazards Mapping Act

Like the Alquist-Priolo Act, the Seismic Hazards Mapping Act of 1990 (PRC 2690–2699.6) is intended to reduce damage resulting from earthquakes. While the Alquist-Priolo Act addresses surface fault rupture, the Seismic Hazards Mapping Act addresses other earthquake-related hazards, including strong ground shaking, liquefaction, and seismically induced landslides. Its provisions are similar in concept to those of the Alquist-Priolo Act: the State is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards, and cities and counties are required to regulate development within mapped Seismic Hazard Zones.

Under the Seismic Hazards Mapping Act, permit review is the primary mechanism for local regulation of development. Specifically, cities and counties are prohibited from issuing development permits for sites in Seismic Hazard Zones until appropriate site-specific geologic or geotechnical investigations have been carried out, and measures to reduce potential damage have been incorporated into the development plans.

California Building Standards Code

The State of California's minimum standards for structural design and construction are given in the California Building Standards Code (CBSC) (24 CCR). The CBSC is based on the Uniform Building Code (UBC) (International Code Council 1997), which is used widely throughout the United States (generally adopted on a state-by-state or district-by-district basis) and has been modified for California conditions with numerous, more detailed or more stringent regulations. The CBSC requires that "classification of the soil at each building site will be determined when required by the building official" and that "the classification will be based on observation and any necessary test of the materials disclosed by borings or excavations." In addition, the CBSC states that "the soil classification and design-bearing capacity will be shown on the (building) plans, unless the foundation conforms to specified requirements." The CBSC provides standards for various aspects of construction, including (i.e., not limited to) excavation, grading, and earthwork construction; fills and embankments; expansive soils; foundation investigations; and liquefaction potential and soil strength loss. New structures constructed as part of the project would be required to comply with all applicable provisions of the CBSC.

California Department of Transportation Standards

In addition to the CBSC, the Department's highway and bridge facilities are subject to numerous standards, including *Caltrans Guidelines for Structures Foundations Report, Version 2* (California Department of Transportation 2006a); *Caltrans Seismic Design Criteria* (California Department of Transportation 2006b); *Caltrans Highway Design Manual (Topic 829)* (California Department of Transportation 2008); *Caltrans Bridge Design Specifications (Section 8)*(California Department of Transportation 2004); and *Caltrans Standard Specifications* (California Department of Transportation 2006c). These standards were developed to ensure that all Department facilities are constructed and maintained to the highest safety standards.

Landslide Hazard Identification Program

The Landslide Hazard Identification Program requires the State Geologist to prepare maps of landslide hazards within urbanizing areas. According to Public Resources Code Section 2687(a), public agencies are encouraged to use these maps for land use planning and for decisions regarding building, grading, and development permits.

Local Standards

Geotechnical Investigations

Local jurisdictions typically regulate construction activities through a multistage permitting process that may require the preparation of a site-specific geotechnical investigation. The purpose of a site-specific geotechnical investigation is to provide a geologic basis for the development of appropriate construction design. Geotechnical investigations typically assess bedrock and Quaternary geology, geologic structure, soils, and the previous history of excavation and fill placement.

Regulation HS.I-22 of the Public Health and Safety Element of the Solano County General Plan (Solano County 2008) requires geotechnical evaluations and recommendations before new development occurs in areas with geologic, soils, or seismic hazards (see the section titled "Solano County General Plan").

Solano County General Plan

Goals, policies, and implementation programs contained in the Public Health and Safety Element of the Solano County General Plan (Solano County 2008) that are applicable to the proposed project are as follows:

> **HS.G-1:** Minimize the potential for loss of life and property resulting from natural or human-caused hazards.
>
> **SEISMIC SAFETY AND LAND STABILITY**
>
> **Policies**
>
> **HS.P-12:** Require new development proposals in moderate or high seismic hazard areas to consider risks caused by seismic activity and to include project features that minimize these risks.
>
> **HS.P-13:** Review and limit the location and intensity of development and placement of infrastructure in identified earthquake fault zones.
>
> **HS.P-14:** Identify and minimize potential hazards to life and property caused by fault displacement and its impact on facilities that attract large numbers of people, are open to the general public, or provide essential community services and that are located within identified earthquake fault zones.
>
> **HS.P-15:** Reduce risk of failure and reduce potential effects of failure during seismic events through standards for the construction and placement of utilities, pipelines, or other public facilities located on or crossing active fault zones.
>
> **HS.P-16:** Require minimum setbacks for construction along creeks between the creek bank and structure, except for farm structures that are not dwellings or places of work, based on the susceptibility of the bank to lurching caused by seismic shaking.
>
> **HS.P-17:** Restrict the crossing of ground failure areas by new public and private transmission facilities, including power and water distribution lines, sewer lines, and gas and oil transmission lines.
>
> **HS.P-18:** Make information about soils with a high shrink-swell potential readily available. Require proper foundation designs in these areas.
>
> **HS.P-19:** Minimize development in areas with high landslide susceptibility.

Implementation Programs

Regulations

HS.I-19: Adopt and enforce the most current versions of the International Building Codes, as modified by the California Building Standards Commission.

HS.I-21: Require geotechnical investigation and recommendations for buildings meant for public occupancy within geologic hazard areas. A state certified Engineering Geologist shall produce a report examining development issues that considers:

- soil, slope, or other geologic hazard conditions found on site;
- potential off-site development impacts, such as increased runoff and/or slope instability; and
- requirements of any regulations concerning the hazard area.

HS.I-22: Require geotechnical evaluation and recommendations before new development in moderate or higher-hazard areas. Such geotechnical evaluation shall analyze the potential hazards from:

- landslides
- liquefaction
- expansive soils
- steep slopes
- erosion
- subsidence
- Alquist-Priolo Earthquake Fault Zones or other identified fault zones
- tsunamis
- seiches

Require new development to incorporate project features that avoid or minimize the identified hazards. Costs related to providing or confirming required geotechnical reports will be borne by the applicant.

Affected Environment

The *Assessment of Fault Rupture and Analysis of Displacement Hazard, Solano Transportation Authority Interchange Project, Cordelia, California (I-80/I-680/SR 12 Interchange)* (Fault Rupture Assessment) and the *Environmental Geotechnical Memorandum, I-80/I-680/SR 12 Interchange Project, Solano County, California, 04-Sol-12, 680, 80 PM Var.* (Environmental Geotechnical Memorandum) were prepared for the project alternatives in 2009. All suggested and applicable measures have been incorporated into the section below. However, as mentioned in both of these studies, additional site-specific study will be required during latter phases of project development. These future studies are also mentioned in the section below.

The project area is located in the Coast Ranges geomorphic province (California Geological Survey 2002). The analysis presented herein focuses on the Quaternary sediments and geologic

hazards pertaining to the project area, except for the ground shaking analysis. This analysis requires a broader view of the region due to the potential for other primary impacts should fault rupture or displacement occur in outlying areas.

Geology and Topography of the Project Area

Surface Geology

Because of the geographical extent of the project alternatives, the project area is divided into three segments: western, central, and eastern. The western segment begins just west of the I-80/Red Top Road interchange and ends at the I-80/Suisun Valley Road interchange. The central segment begins at the I-80/Suisun Valley Road interchange and ends at the SR 12E/Chadbourne Road interchange. The eastern segment begins at the SR 12E/Chadbourne Road interchange and ends at the Fairfield Overhead where SR 12E crosses over the UPRR tracks west of Suisun City.

The Environmental Geotechnical Memorandum indicates that the project area is underlain by alluvial and bedrock units. Bedrock consists of sedimentary rock formations, metamorphic rocks, and volcanic rock units that extend across Solano County from the marshlands on the east to the foothills on the west. Geologic units and structures in the vicinity of the project area have been mapped by several geologists, including Wagner and Bortugno (1982), Manson (1998), Bezore et al. (1988), and Graymer et al. (2002).[1] Based on the published geologic maps, the central and eastern portions of the project area are underlain by late Pleistocene to Holocene age alluvial fan deposits (Qf) and Holocene fan deposits (Qhf), which are the most extensive Quaternary age units in the project area. The alluvial fan deposits consist of sediments deposited by streams that originate from mountain canyons and flow onto alluvial valley floors or alluvial plains in the form of debris flows, hyperconcentrated mudflows, or stream flows. The particle size of these deposits typically decreases downslope from the fan apex. In some places, Holocene fan deposits (Qhf) may be only a thin veneer over late Pleistocene to Holocene fan deposits (Qf). Holocene-age natural levee deposits (Qhl) were formed by streams that overtopped their banks and deposited sediment adjacent to their channels.

The southwestern (western segment) portion of the project area is located on hillside terrain underlain by bedrock units that consist primarily of sedimentary and volcanic formations that have been folded and faulted as well as having been influenced by local landslides. The Eocene-age Markley Formation (Tmk) consists of micaceous marine sandstones. The overlying Pleistocene-age Sonoma volcanics contain extrusive basalt and ryholite flows, agglomerates and tuffs, ash-flow tuffs, and andesitic-flow breccias and agglomerates. Potassium/argon radiometric dating of the Sonoma volcanics exposed locally near St. Helena indicates an age of 2.9 million years.

Figure 3.2.3-1 depicts lithologic descriptions, as shown in the Environmental Geotechnical Memorandum for the project alternatives. The main geologic units, as described by Bezore et.al. (1998), mapped within the project area include:

[1] Relevant portions of these published maps are shown on Plates 4, 5, and 6 of the Environmental Geotechnical Memorandum.

- Qhf—Fan deposits (Holocene): Moderately sorted to poorly sorted and moderately bedded to poorly bedded sand, gravel, silt, and clay deposited where streams emanate from upland regions onto more gently sloping valley floors or plains.
- Qhl—Natural levee deposits (Holocene): Moderately sorted to well-sorted sand with some silt and clay deposited by streams that overtop their banks during flooding.
- Qf—Fan deposits (late Pleistocene to Holocene): Poorly sorted, moderately bedded to poorly bedded sand, gravel, silt, and clay deposited in gently sloping alluvial fans. These deposits are about 10% denser and have 50% greater penetration resistance than unit Qhf.
- Qls—Landslide deposits (Holocene and Pleistocene): Chaotic deposits of sand, silt, clay, angular boulders, and blocks of bedrock up to hundreds of feet long deposited by gravity-driven skidding and flow.
- Tsv—Sonoma volcanics, undivided (Pleistocene): Basalt to rhyolite flows, agglomerates, and tuffs.
- Tst—Ash-flow tuff (Pliocene): Pumicitic, locally welded, with agglomeritic tuff.
- Tsa—Andesites (Pliocene): Andesitic flows, breccias, and agglomerates.
- Tss—Sandstone and volcanic gravel (Pliocene): Poorly consolidated, tuffaceous sandstone with lenses of volcanic conglomerate.
- Tmk—Markley formation (Eocene): Gray to yellow-brown, micaceous marine arkosic sandstone. Massive to well-bedded; contains abundant muscovite.
- Ku—Undivided sandstone, siltstone, and shale of the Great Valley Complex (late Cretaceous): Interbedded carbonaceous−biotite wacke, white−mica−carbonaceous sandstone, greenish−gray mudstone and shale, laminated fine−grained sandstone and gray shale, carbonaceous siltstone, black shale, and fine−grained mica wacke.

Subsurface Geology

According to published geologic maps and as reported in the project's Environmental Geotechnical Memorandum, the geologic units beneath specific portions of the project area are those shown in Table 3.2.3-1.

Table 3.2.3-1. Subsurface Geologic Units for the Project Area[a]

Approximate Location and Segment	Geology
I-80/SR 12W interchange and its vicinity (eastern and central segments)	Fan deposits (Qf) (late Pleistocene to Holocene); alluvium, undivided (Qa) (late Pleistocene to Holocene); artificial fill (af); Markley formation (Tmk) (Eocene); andesites (Tsa) (Pliocene); Sonoma volcanics, undivided (Tsv) (Plioecene)
Future I-680/Red Top Road interchange and its vicinity (western segment)	Fan deposits (Qf) (late Pleistocene to Holocene); fan deposits (Qhf) (Holocene); some modern stream channel deposits (Qhc) (Holocene)
Green Valley Road and its vicinity (western segment)	Fan deposits (Qf) (late Pleistocene to Holocene); fan deposits (Qhf) (Holocene); ash-flow tuff (Tst) (Pliocene); some modern stream channel deposits (Qhc) (Holocene)
Suisun Valley Road and its vicinity (western and central segments)	Fan deposits (Qhf) (Holocene); ash-flow tuff (Tst) (Pliocene)
I-80/SR 12E interchange and SR 12E (eastern segment)	Mainly alluvial fan deposits (Qhf) (Holocene); natural levee deposits (Qhl) (Holocene)

[a] Adapted from the first table shown on page 4 of the project's Environmental Geotechnical Memorandum.

For more information on subsurface geology and structure, including a detailed explanation of bedding planes, folds, and faults, refer to the Environmental Geotechnical Memorandum prepared for the proposed project.

Topography

Review of the 1980 United States Geologic Survey (USGS) map for the Fairfield South and Cordelia, California quadrangles indicates that the project area is located at approximate elevations between more than ten and more than 250 feet above mean sea level. The project area generally slopes to the east, toward wetlands and sloughs associated with Suisun Bay. The general terrain of the project area consists of hills on the north and northwest sides near Red Top Road and relatively level areas (Suisun Valley and Green Valley) in the central and eastern segment of the project area.

Seismicity

The project area is located in a region of California characterized by locally high historical seismic activity and is within UBC Seismic Hazard Zone 4. A number of active faults and fault zones are present in and adjacent to the project area. Consequently, the project area is subject to surface fault rupture and ground shaking (primary hazards), and seismically induced ground failure (a secondary hazard).

Fault Rupture Hazard

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) is to regulate development near active faults to mitigate the hazard of surface rupture. Faults in an Alquist-Priolo Earthquake Fault Zone are active faults. As defined under the Alquist-Priolo Act, an active fault is one that has had surface displacement within Holocene time.

The dominant tectonic features in the project area are the Green Valley fault[2, 3] and the Cordelia fault zone, both of which are zoned by the State of California pursuant to the Alquist-Priolo Earthquake Fault Zoning Act (Hart and Bryant 1997), and are considered a Type A (highest risk) seismic source by the UBC and California Building Codes (International Conference of Building Officials 1998[4]).

The Green Valley fault extends from Suisun Bay northwest to Wooden Valley, traversing the rapidly developing I-680 corridor in central and eastern Solano County, near Fairfield. Along its length, the Green Valley fault intersects several major transportation routes, rail lines, power transmission lines, pipelines, and levees.

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[2] The Green Valley fault is often grouped together with the Concord fault and referred to as the Concord-Green Valley fault system. Part of the eastern San Andreas fault system, it is composed of at least two major fault segments, from south to north: the Concord fault (10–15 miles long) and the Green Valley fault (18–27 miles long).

[3] The Green Valley fault in the vicinity of the project area consists of four distinct fault strands (Fault Rupture Assessment; Environmental Geotechnical Memorandum).

[4] The 1998 International Conference of Building Officials maps have recently been superseded by an interactive U.S. Geological Survey website (http://gldims.cr.usgs.gov/webapps/cfusion/Sites/qfault/index.cfm) that plays the same role relative to the International Building Code (IBC) and the later (post-1997) versions of the CBSC, which are based on IBC instead of UBC. The older information and classification of these faults is provided herein to stress their high seismic potential.

The Cordelia fault zone, located approximately 5,800 feet east of the Green Valley fault, has a well-defined north-striking surface expression, and may represent a secondary trace of the Green Valley fault, according to the Fault Rupture Assessment. See Plate 7 of the Environmental Geotechnical Memorandum for images of these earthquake fault zones as they relate to the project area. Also see Plate 3 of the Environmental Geotechnical Memorandum for a map of the regional faults surrounding the project area.

Both of the faults are generally located in the western segment of the project area. The Green Valley fault and the Cordelia fault zone cross the project alignment of Alternative B. These faults are within State (Alquist-Priolo) Earthquake Fault Zones. No fault is directly beneath any proposed elevated structures that are proposed for Alternative B or Alternative B, Phase 1.[5,6] However, under Alternative C and Alternative C, Phase 1, several proposed structures are located in the vicinity of the Green Valley fault.

In summary, the potential for surface fault rupture in the vicinity of the project area is generally high.

Ground-Shaking Hazard

The project area is located within UBC Seismic Hazard Zone 4 and is located in a region of California characterized by locally high historical seismic activity. The State of California (Hart and Bryant 1997) and the U.S. Geological Survey (U.S. Geological Survey 2008) recognize various active seismic sources in the project area vicinity. As described above, the risk of surface rupture in the study area is generally high because of its proximity to active faults. Earthquake-induced ground shaking also poses a significant hazard.

The intensity of ground shaking that would occur in the project area as a result of an earthquake is partly related to the size of the earthquake, its distance from the project area, and the response of the geologic materials within the project area. As a rule, the greater the earthquake magnitude and the closer the fault rupture to the site, the greater the intensity of ground shaking. When various earthquake scenarios are considered, ground-shaking intensities will reflect both the effects of strong ground accelerations and the consequences of ground failure.

Estimates of Earthquake Shaking

Based on the seismic hazard map prepared by Mualchin (1996), the peak bedrock acceleration in the project area ranges from 0.5 *g* to 0.6 *g* (where one *g* equals the force of gravity). According to the *Caltrans Guidelines for Structures Foundation Report* (California Department of Transportation 2006a), the value of peak bedrock acceleration (for a specific project site or area) from the seismic hazard map should be verified using the attenuation relation by Sadigh et al.

[5] The primary rupture zone for the Cordelia fault does not intersect the proposed elevated structure, and thus the risk for surface-fault rupture is considered low. However, to account for uncertainty in the borehole and geophysical data and the spacing between boreholes that led to these conclusions, the proposed structure should be designed to accommodate minor secondary displacement (e.g., tilting, shearing, and settlement) associated with an earthquake on the Cordelia fault, as recommended in the Fault Rupture Assessment. See the section titled "Avoidance, Minimization, and/or Mitigation Measures" for more information.

[6] Several primary active faults directly impact the proposed structures within the Green Valley fault, but Alternative C has more proposed structures in the vicinity of the Green Valley fault compared to Alternative B (Fault Rupture Assessment; Environmental Geotechnical Memorandum).

(1997). Based on the attenuation relation, the controlling fault is the Cordelia fault, and peak bedrock acceleration of 0.6 *g* is anticipated in the project area. Furthermore, based on a probabilistic seismic hazard map that depicts the peak horizontal ground acceleration values exceeded at a 10% probability in 50 years (Cao et al. 2003; California Geological Survey 2003), the probabilistic peak horizontal ground acceleration values in the project area range from 0.5 *g* to 0.6 *g*, thus confirming that the possibility of the project area experiencing strong ground shaking may be considered moderate to high.

Based on existing published data on officially recognized faults, the following faults are considered to have the greatest potential to affect the project area due to both fault rupture and ground shaking: the Cordelia fault, the Green Valley fault, and the Vaca-Kirby Hill–Montezuma Hills faults (these latter faults are considered early Quaternary and therefore "potentially active").[7] Maximum credible earthquake magnitudes for some of the major faults in the vicinity of the project area determined by Mualchin (1996) are summarized in Table 3.2.3-2. Based on the project's Environmental Geotechnical Memorandum, these maximum credible earthquake magnitudes represent the largest earthquakes that could occur on the given fault based on the current understanding of the regional tectonic structure.

Table 3.2.3-2. Characteristics of Local Faults[a]

Fault/Faults	Maximum Credible Earthquake Magnitude[b]	Distance between Fault/ Faults and Project Area (miles)	Peak Bedrock Acceleration (*g*)[b]	Zoned by State of California
Cordelia	6.5	0	0.6	Yes
Green Valley	6.75	0	0.6	Yes
Vaca-Kirby Hill–Montezuma Hills	6.75	~7	0.6	Yes

[a] Adapted from Table 1 on page 11 of the Environmental Geotechnical Memorandum prepared for the proposed project.
[b] Mualchin 1996.

Accordingly, based on available geological and seismic data, the possibility of the project area experiencing strong ground shaking may be considered moderate to high.

Liquefaction Susceptibility

Liquefaction is a phenomenon in which the strength and stiffness of unconsolidated sediments are reduced by earthquake shaking or other rapid loading. Poorly consolidated, water-saturated fine sands and silts having low plasticity and within 50 feet of the ground surface are typically considered to be the most susceptible to liquefaction. Soils and sediments that are not water saturated and that consist of coarser or finer materials are generally less susceptible. Geologic age also influences the potential for liquefaction. Sediments deposited within the past few thousand years are generally much more susceptible than older Holocene sediments; Pleistocene sediments are even more resistant; and pre-Pleistocene sediments are generally immune (California Division of Mines and Geology 1997).

[7] Based on research conducted on the earthquake probabilities in the San Francisco Bay region, the Working Group on California Earthquake Probabilities (2003) suggests the Green Valley fault has a 4% probability of one or more major (i.e., magnitude greater than 6.7) earthquakes during the coming 30 years. According to the same study, there is a 62% probability of at least one earthquake of magnitude 6.7 or greater striking the San Francisco Bay region before 2031.

The potential for liquefaction in the project area was preliminarily evaluated by the project's Environmental Geotechnical Memorandum. Based on available boring information, the project area is generally underlain by stiff to very stiff clay with occasional pockets/lenses/layers of loose to medium dense sands. Also, based on the Liquefaction Susceptibility Map included as Plates No. 8-1 and 8-2 in the project's Environmental Geotechnical Memorandum, the liquefaction potential within the project area corridor is considered moderate, with the exception of areas along the eastern portion of Jameson Canyon Creek; at Suisun Creek, Green Valley Creek, and Ledgewood Creek; and in the eastern segment of the project area, where it is considered high. See Plate 8 of the project's Environmental Geotechnical Memorandum for the liquefaction susceptibility map for the project area.

Two potential ground failure types associated with liquefaction are lateral spreading and differential settlement (Association of Bay Area Governments 2001). Lateral spreading involves a layer of ground at the surface being carried on an underlying layer of liquefied material over a nearly level surface toward a river channel or other open face. Differential settlement occurs when the layers that liquefy are not of uniform thickness, a common problem when the liquefaction occurs in artificial fills. Settlement can range from 1% to 5%, depending on the cohesiveness of the sediments (Tokimatsu and Seed 1984). The moderate liquefaction susceptibility in the project area and the soil characteristics equate to a high risk of lateral spreading along the creek areas and a moderate risk of differential settlement elsewhere.

Seismically Induced Ground Failure and General Slope Stability

The project alternatives would extend across hillsides and slopes that may pose some risk from landslides or debris flows. According to the State's Landslide Hazard Report for the Cordelia Quadrangle (Manson 1998), there are landslide deposits, elevated landslide potential, and some debris-flow potential in the southwestern portion of the project area (see Parikh 2009, Plates 10-1 and 10-2 for Manson's [1998] Landslide Inventory Map; Plates 11-1 and 11-2 for the Landslide Susceptibility Map; and Plates 12-1 and 12-2 for the Debris-Flow Susceptibility Map).

Approximately 400 to 1,400 feet northwest of its intersection with I-80, the proposed extension of Red Top Road under both alternatives would cross a large mapped landslide which appears to have moved toward the east. Where the proposed extension of Red Top Road intersects SR 12W, it would cross onto a series of mapped landslides that, except for 450 feet of apparently intact bedrock ridgeline, extend approximately 1,400 feet to the northeast where the proposed road will curve around and reach the valley margin. Where the Red Top Road extension is planned, Manson (1998) categorized the hillsides as "Area 4—most susceptible to landsliding" and the eastern half of that area as "Area C—most susceptible to debris flows."

Soils

Surface Soil Conditions

According to the Soil Survey of Solano County, California (Bates 1977), the predominant surface soil materials within the project area are the Clear Lake clay (CeA), Conejo gravelly loam (Co), Sycamore silty clay loam (Sr), and Yolo silty clay loam (Ys)[8]. These soils are

[8] See Plate 9 of the Environmental Geotechnical Memorandum for a figure showing all surface soil map units in the project area.

generally fine-textured, poorly drained to well drained, have slopes between 0%–2%, very slow runoff to slow runoff; low to high shrink-swell potential; and generally a slight hazard of water erosion.

Based on Table 3.2.3-3 and on Plate 9 of the project's Environmental Geotechnical Memorandum, the soils in the project area are mainly silty clay loams and clay loams. Permeability or hydraulic connectivity is moderately low to high and runoff rate is very slow to rapid. Soils are poorly drained to well drained and erosion hazard is low to moderately high. Shrink-swell potential varies depending on texture, but is considered high for any soils with a high clay content.

Subsurface Soil Conditions

The underlying native soil map units and their characteristics are shown in Table 3.2.3-3. Additional subsurface soil conditions and groundwater conditions[9] within the project area limits are shown in the first table on page 7 of the project's Environmental Geotechnical Memorandum.

Table 3.2.3-3. Underlying Native Soil Map Unit Characteristics of the Project Area[a]

Soil Map Unit	Soil Map Unit Name	Surface Texture	Permeability	Slope (%)	Drainage	Available Water Holding Capacity	Erosion Hazard	Shrink-Swell Potential
Sr	Sycamore silty clay loam	Silty clay loam	Moderately high	0–2	Poorly drained	High	Low	Moderate
Ss	Sycamore silty clay loam, drained	Silty clay loam	Moderately high	0–2	Poorly drained	High	Low	Moderate
CeA	Clear Lake clay	Clay	Moderately low to high	0–2	Poorly drained	Moderate	Moderate	High
HaF	Hambright loam	Loam to cobbly loam	Moderately high to high	15–40	Well drained	Very low	Moderately high	Low to moderate
CiA	Clear Lake clay, saline	Clay	Moderately low to high	0–2	Poorly drained	Low	Moderate	High
BrA	Brentwood clay loam	Clay loam	Moderately high	0–2	Well drained	High	Low	High
AoA	Antioch–San Ysidro complex	Sandy loam to clay loam	Very low to moderately low	0–2	Moderately well drained	Very low	Moderately high	Low to high

[a] Adapted from the first table shown on page 13 of the project's Environmental Geotechnical Memorandum and Soil Survey of Solano County, California (Bates 1977).

Environmental Consequences

Risk of Fault Rupture during Operations

Based on available knowledge of fault locations and fault rupture hazard, the risk of surface fault rupture in the project area is generally high because of its proximity to active faults. Fault rupture has the potential to compromise the structural integrity of proposed new facilities and cause injury to construction workers. Effects of the project alternatives related to potential structural

[9] Groundwater depths in the project area typically range from 10–15 feet below ground surface.

damage and injury caused by fault rupture would be minimized with implementation of state and local requirements and recommendations from the draft geotechnical reports.

The No-Build Alternative would not result in new structures in the project area. There would be no potential structural damage or resulting injury caused by fault rupture associated with the No-Build Alternative.

Risk from Ground Shaking during Operation

Based on available knowledge of fault locations and ground shaking potential, the possibility of the project area experiencing strong ground shaking may be considered moderate to high because of its proximity to active faults. Without proper seismic engineering, a large earthquake on a nearby fault could cause moderate ground shaking in the project area, potentially resulting in liquefaction and associated ground failure, such as lateral spreading or differential settlement, which in turn could increase the risk of structural loss, injury, or death. Effects of the project alternatives related to potential structural damage and injury caused by ground shaking would be minimized with implementation of state and local requirements and recommendations from the draft geotechnical reports.

The No-Build Alternative would not result in new structures in the project area. There would be no potential structural damage or resulting injury caused by ground shaking associated with the No-Build Alternative.

Risks from Development on Unstable Materials

Liquefaction in the project area could increase the risk of structural loss, injury, or death. Effects of the project alternatives related to potential structural damage and injury caused by liquefaction would be minimized with implementation of state and local requirements and recommendations from the draft geotechnical reports.

The impact of the post-liquefaction settlement on the roadway portions of the project alternatives is relatively small because the potentially liquefiable soil layers are generally covered by cohesive soils, which tend to serve as a "soil mat" and should reduce the potential impact of liquefaction. Any potential post-liquefaction settlement at abutments, bents, or piers of proposed bridge structures may cause downdrag (due to the clay above the liquefiable sand layer) and reduce the load carrying capacity of the piles. Typical mitigation (described below) is to design the foundation for such conditions. Based on the Environmental Geotechnical Memorandum prepared for the project alternatives, liquefaction should not be a significant impact on pavement surfaces because the resulting settlements are generally aerial in type and localized.

The No-Build Alternative would not result in new construction in the project area. There would be no potential structural damage or resulting injury resulting from development on materials prone to ground failure, including materials subject to liquefaction associated with the No-Build Alternative.

Risk from Landslides or Other Slope Failure during Operation

The project alternatives would extend across hillsides and slopes that may pose some risk from landslides or debris flows. As such, new construction in the project area would be at risk for structural damage or personal injury resulting from landslides or other slope failure.

Effects of the project alternatives related to potential structural damage and injury caused by landslides or other slope failures would be minimized with implementation of state and local requirements and recommendations from the draft geotechnical reports.

The No-Build Alternative would not result in new construction in the project area. There would be no potential structural damage or resulting injury resulting from landslides or other slope failure associated with the No-Build Alternative.

Risk during Operation as a Result of Development on Expansive Soils

Various soil map units (both surface and subsurface) in the project area have been identified as having moderate to high shrink-swell potential and therefore have the potential to compromise the structural integrity of proposed new facilities (including roadways, bridges, and other associated features). Effects of the project alternatives related to potential structural damage caused by shrink-swell would be minimized with implementation of state and local requirements and recommendations from the draft geotechnical reports. Furthermore, project activities would cause no change in current conditions with respect to the current shrink-swell hazards.

The No-Build Alternative would not result in new construction in the project area. There would be no potential structural damage or resulting injury resulting from development on expansive soils associated with the No-Build Alternative.

Risk during Operation as a Result of Weak Foundation Materials and Postconstruction Settlement

In general, short-term and long-term consolidation settlements do not appear to be a reason for concern in the project area, except near Suisun Valley Road and Dan Wilson Creek where soft clays are indicated in test borings. In these areas, consolidation settlements may pose a significant hazard to the immediate structures. Conducting future geotechnical investigations and implementing recommendations from the draft geotechnical reports would lessen the severity of this potential hazard.

The No-Build Alternative would not result in new construction in the project area and therefore, there would be no potential structural damage or resulting injury resulting from weak foundation materials and postconstruction settlement associated with the No-Build Alternative.

Runoff, Erosion, and Sedimentation from Grading Activities Associated with Construction

Grading, excavation, removal of vegetation cover, and loading activities associated with construction activities could temporarily increase erosion and sedimentation. Construction

activities also could result in soil compaction and wind erosion effects that could adversely affect soils and reduce the revegetation potential at the construction sites and staging areas.

A SWPPP will be developed by a qualified engineer or erosion control specialist and implemented before construction as described in Section 3.2.2, "Water Quality and Stormwater Runoff." Furthermore, compliance with the County's Grading Ordinance also would minimize any negative effects associated with erosion and sedimentation. A grading permit as required by Chapter 31 of the Solano County Code (Solano County 2009) will be required for this project. As part of this permit, the project applicant will be required to submit a grading and erosion control plan, vicinity and site maps, and other supplemental information. Additionally, standard conditions in the grading permit include an extensive list of BMPs similar to those described in a SWPPP above.

The No-Build Alternative would not result in new construction in the project area. There would be no effects from runoff, erosion, and sedimentation from grading activities associated with construction.

Avoidance, Minimization, and/or Mitigation Measures

Future measures need to be conducted/developed prior to/or during the plans, specification, and estimate phase for any build alternative.

Implement Requirements from State and Local Standards into Final Project Design

UBC Seismic Hazard Zone 4/CBSC, Department, and County General Plan standards are required to be implemented and incorporated into the project design for applicable features to minimize the potential fault rupture, ground shaking, liquefaction, and shrink-swell hazards on associated project features. Structures must and will be designed to meet the regulations and standards associated with UBC Seismic Hazard Zone 4 hazards.

Implement Recommendations from Draft Geotechnical Reports to Accommodate Permanent Fault-Related Ground Deformation Effects from Surface Fault Rupture on Project Facilities and to Accommodate Effects of Ground Shaking on Project Facilities

Recommendations from both the Fault Rupture Assessment and the Environmental Geotechnical Memorandum for the proposed project will be incorporated in to the final project design.

The primary rupture zone for the Cordelia fault does not intersect proposed elevated structures, and thus the risk for surface-fault rupture is considered low. However, to account for uncertainty in the borehole and geophysical data that led to these conclusions, proposed structures should be designed to accommodate minor secondary displacement (e.g., tilting, shearing, and settlement) associated with an earthquake on the Cordelia fault.

The following recommendations from the Fault Rupture Assessment report and project's Environmental Geotechnical Memorandum will be incorporated in to the final project design to accommodate permanent fault-related ground deformation effects from surface fault rupture on project facilities.

- As described in the Fault Rupture Assessment, fault rupture hazard maps prepared for both the Cordelia and Green Valley Project sites should be considered during design of the proposed elevated structures for mitigation of surface-fault rupture. This could include avoidance where possible, or if not possible, special design to accommodate the estimated coseismic displacement yielded by the two approaches.[10]
- As described in the Environmental Geotechnical Memorandum, if avoidance is not possible, special design should be considered to accommodate the displacement estimated by the Department and based on scenario-based fault displacement hazard (FDHA) analysis approach.
- Department engineers responsible for the design of the elevated structures should evaluate the state's recommended criteria, Draft Memo to Designers 20-10 (California Department of Transportation 2007) for surface-fault rupture with regard to the results of the fault hazard displacement analysis. A geotechnical engineer and/or structural engineer should review the results of the two methods, consider an appropriate factor of safety and design the structures with respect to permanent ground deformation, as recommended in the Fault Rupture Assessment.
- On the basis of the Department's Draft Memo to Designers 20-10 (California Department of Transportation 2007), a fault displacement of 1.9 feet from the Green Valley fault should be considered in the design of elevated structures crossing the fault zone.

Based on the attenuation relation by Sadigh et al. (1997), the controlling fault is the Cordelia fault, and peak bedrock acceleration of 0.6 *g* is anticipated in the project area. The following recommendations from the Fault Rupture Assessment and the Environmental Geotechnical Memorandum will be incorporated in to the final project design to accommodate effects of ground shaking on project facilities:

- Structures should be designed based on the Acceleration Response Spectrum (ARS) Curve according to the *Caltrans Seismic Design Criteria Manual*.[11]
- Geologic conditions encountered at the Cordelia project site included lenses of saturated granular deposits. The Cordelia project site should be evaluated for liquefaction, lateral spreading and settlement associated with strong ground shaking.
- Geologic conditions encountered at the Green Valley project site included lenses of saturated fine- to coarse-grained deposits along the western and eastern margins of Quarry Hill. Portions of the Green Valley site should be evaluated for liquefaction, lateral spreading, and settlement associated with strong ground shaking.

[10] The fault displacement hazard analysis and the resulting displacement values for the multiple fault traces comprising the Green Valley fault depend on site information and results from previous studies. Future investigations (trenches and boreholes) may allow refinement of the calculations, an improved model of uncertainties, and revised fault rupture hazard maps.

[11] The criteria include, but are not limited to, designing infrastructure that can withstand an earthquake of magnitude 7.5 and a peak bedrock acceleration of 0.6 *g* with modifications. Other specific design criteria are further described in the *Caltrans Seismic Design Criteria Manual* (California Department of Transportation 2006b).

Conduct Future Geotechnical Investigations

In accordance with applicable state and local laws, a final geotechnical investigation (or investigations) will be conducted to evaluate the engineering properties of the subsurface soil materials for recommendation of geotechnical parameters, to address geotechnical hazards (e.g., slope stability, differential settlement) associated with different design elements , as well as hazards associated with potential fault rupture/creep or strong ground motion (e.g., shaking, liquefaction, earthquake-induced landslides).[12] The final geotechnical investigation will include recommendations for designing specific project elements to accommodate the effects of fault rupture and ground shaking.

Implement Recommendations from Draft Geotechnical Report to Accommodate Effects of Liquefaction on Project Facilities/Design Specific Project Elements to Accommodate Effects of Liquefaction

The following recommendations from the project's Environmental Geotechnical Memorandum will be incorporated into the final project design.

- Design foundations to withstand the effects of liquefaction. Any downdrag load on the piles due to potential post-liquefaction settlement should be considered in the vertical pile capacity analyses.
- Shallow zones of liquefiable materials can be removed and replaced or treated with materials that can improve their properties (such as by grouting).
- Site-specific liquefaction potential in areas with moderate and/or high liquefaction susceptibility should be evaluated in the plans, specifications, and estimates phase.

If shallow zones of liquefiable soils or soils susceptible to seismically induced settlement are determined to be present at any location where project activities would occur, corrective actions shall be taken, including removal and replacement of soils; on-site densification; grouting; and design of special foundations or other similar measures, depending on the extent and depth of susceptible soils. All of these measures reduce pore water pressure during ground shaking by densifying the soil or improving its drainage capacity.

Conduct Future Geotechnical Investigation/Implement Preliminary Recommendations from Draft Geotechnical Report to Accommodate Effects of Slope Failure on Project Facilities

The following recommendations from the project's Environmental Geotechnical Memorandum will be incorporated into the final project design.

- Because significant grading can be expected for construction of the roadway, site-specific investigation of those mapped landslides will be needed to assess the potential impacts and formulate appropriate mitigation measures.

[12] The last section of the Environmental Geotechnical Memorandum provides a recommended scope of geotechnical investigation.

- Specific recommendations pertaining to cut slopes and fill slopes/embankments should be incorporated into the final project design. For cut slopes, recommendations pertaining to suggested slope gradients, rock bedding and joint evaluation, drilling and geophysical testing, and slope stabilization measures should be implemented. For fill slopes/embankments, recommendations pertaining to suggested slope gradients and slope stabilization measures should be implemented.

Implement Preliminary Recommendations from Draft Geotechnical Report to Accommodate Effects of Consolidation Settlements on Project Facilities

The following recommendations from the project's Environmental Geotechnical Memorandum report will be incorporated into the final project design.

- Department embankment construction standards as outlined in Section 19 of the California Department of Transportation Standards Specifications (California Department of Transportation 2006c) should be followed.
- If further investigation shows that consolidation settlement may become critical to the other project improvements, mitigation measures such as phased construction, implementation of waiting periods, surcharge fill, wick drain installation, and monitoring may be required.

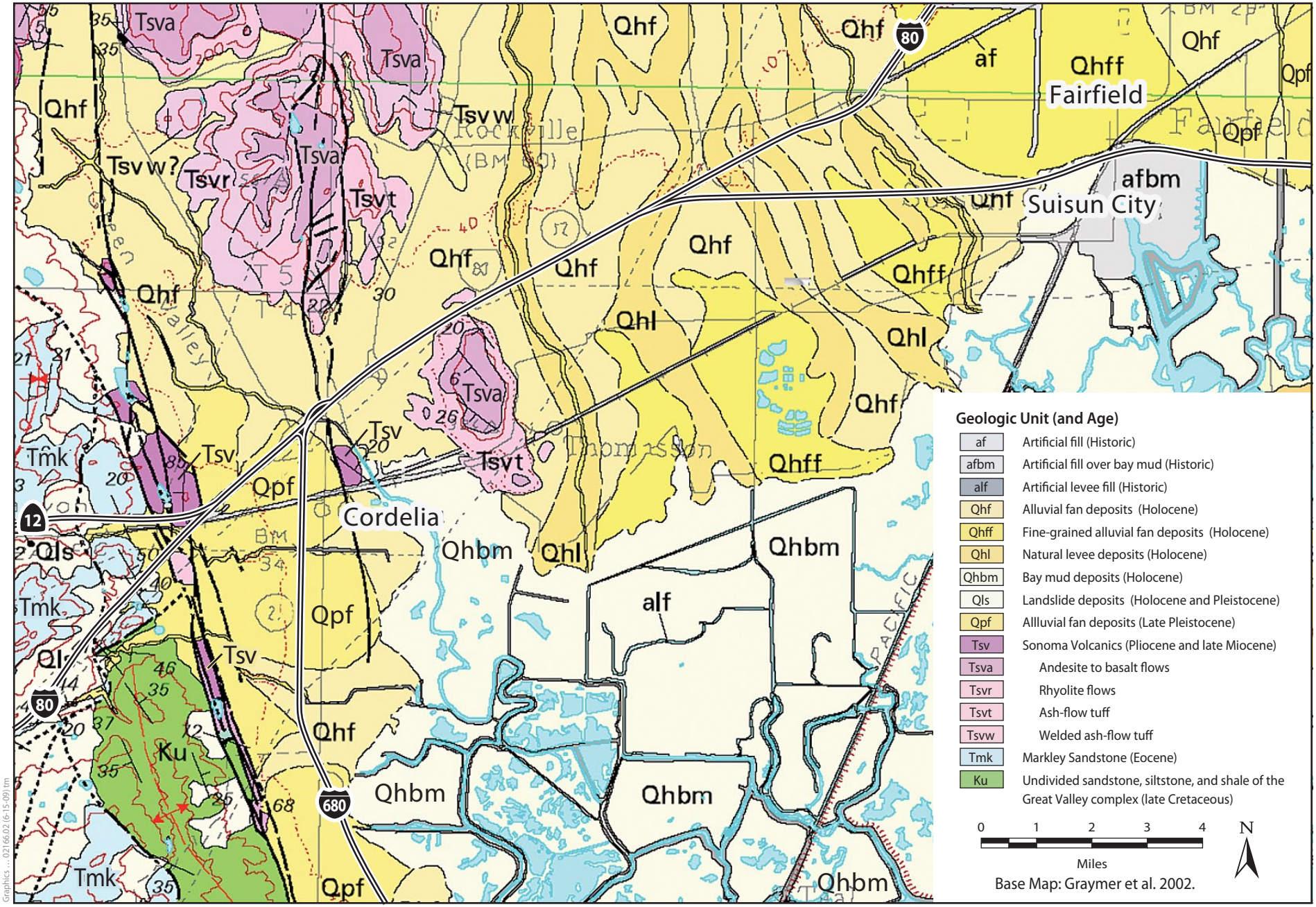


Figure 3.2.3-1
Geologic Map of the Project Vicinity

3.2.4 Paleontology

Regulatory Setting

Paleontology is the study of life in past geologic time based on fossil plants and animals. A number of federal statutes specifically address paleontological resources, their treatment, and funding for mitigation as a part of federally authorized or funded projects. (e.g., Antiquities Act of 1906 [16 USC 431-433], Federal-Aid Highway Act of 1960 [23 USC 305]). Under California law, paleontological resources are protected by the California Environmental Quality Act, the California Code of Regulations, Title 14, Division 3, Chapter 1, Sections 4307 and 4309, and Public Resources Code Section 5097.5.

Federal Regulations

Omnibus Public Lands Act of 2009

The Omnibus Public Lands Act of 2009 (H.R. 146 [2009], Pub. L. No. 111-11) includes provisions for the protection and preservation of paleontological resources. Under this law, the Secretaries of both the Department of the Interior and the Department of Agriculture are directed to inventory, manage, and protect paleontological resources on the public lands they administer. In addition, the Secretaries are directed to coordinate these efforts and to establish education programs to increase public awareness of the significance of paleontological resources. The law also prohibits the collection of paleontological resources from federal land without a permit, except in the case of noncommercial collecting that complies with other regulations for that federal land.

State Regulations

California Environmental Quality Act

CEQA encourages the protection of all aspects of the environment by requiring state and local agencies to prepare multidisciplinary analyses of the environmental impacts of a proposed project and to make decisions based on the findings of those analyses.

CEQA includes in its definition of *historical resources* "any object [or] site … that has yielded or may be likely to yield information important in prehistory" (State CEQA Guidelines 15064.5[3]), which typically is interpreted as including fossil materials and other paleontological resources. More specifically, destruction of a "unique paleontological resource or site or unique geologic feature" constitutes a significant impact under CEQA (State CEQA Guidelines, Appendix G). The treatment of paleontological resources under CEQA is generally similar to the treatment of cultural resources, requiring an evaluation of resources in a project's area of potential effects; an assessment of potential impacts on significant or unique resources; and the development of mitigation measures for potentially significant impacts, which may include monitoring combined with data recovery or avoidance.

California Public Resources Code

Several sections of the California Public Resources Code (PRC) protect paleontological resources. PRC 5097.5 prohibits "knowing and willful" excavation, removal, destruction, injury,

and defacement of any paleontologic feature on public lands (lands under the jurisdiction of a state, county, city, district, or public authority or under the jurisdiction of a public corporation), except where the agency with jurisdiction has granted express permission. PRC 30244 requires reasonable mitigation for impacts on paleontological resources that occur as a result of development on public lands. The sections of the California Administrative Code relating to the state Division of Beaches and Parks afford protection to geologic features and "paleontological materials" but grant the director of the state park system authority to issue permits for specific activities that may result in damage to such resources, if the activities are in the interest of the state park system and for state park purposes (California Administrative Code 4307–4309).

Local Regulations

The Solano County General Plan does not have policies related to paleontological resources. However, the background report prepared for the Solano County General Plan update (EDAW 2006:7-23–7-26) assigns a paleontological sensitivity to geologic units found in the county. The sensitivity evaluations are based on the Society of Vertebrate Paleontology (SVP) guidelines and record searches of the University of California Museum of Paleontology (UCMP) database (EDAW 2006:7-20 and 7-26). In addition, the EIR written for the general plan update provides mitigation measures to protect paleontological resources (EDAW 2008:4.10-39–4.10-40).

Professional Standards and Guidelines

In response to a recognized need for standard guidance, the SVP published *Standard Guidelines for the Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontologic Resources*, a set of standard guidelines that are now widely followed (Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995, updated 2007). These guidelines are generally consistent with Caltrans criteria and represent the accepted standard of care for paleontological resources. The SVP guidelines identify two key phases in the process for protecting paleontological resources from project impacts.

1. Assess the likelihood that the project's area of potential effect contains significant nonrenewable paleontological resources that could be directly or indirectly affected, damaged, or destroyed as a result of the project.
2. Formulate and implement measures to mitigate potential adverse impacts.

An important strength of the SVP's approach to assessing potential impacts on paleontological resources is that the SVP guidelines provide some standardization in evaluating a project area's paleontological sensitivity. Table 3.2.4-1 defines the SVP's sensitivity categories for paleontological resources and summarizes SVP's recommended treatments to avoid adverse impacts in each sensitivity category.

Table 3.2.4-1. Society of Vertebrate Paleontology's Definitions of Sensitivity Categories and Recommended Treatment for Paleontological Resources

Sensitivity Category	Definition	Recommended Mitigation Treatment
High	Areas underlain by geologic units from which vertebrate or significant invertebrate fossils or suites of plant fossils have been recovered	• Preliminary survey and surface salvage before construction begins • Monitoring and salvage during construction • Specimen preparation; identification, cataloging, curation, and storage of materials recovered • Preparation of final report describing finds and discussing their significance • All work should be supervised by a professional paleontologist who maintains the necessary collecting permits and repository agreements
Undetermined	Areas underlain by geologic units for which little information is available	• Preliminary field surveys by a qualified vertebrate paleontologist to assess the project area's sensitivity • Design and implementation of mitigation if needed, based on the results of field survey
Low	Areas underlain by geologic units that are not known to have produced a substantial body of significant paleontologic material	Protection and salvage generally are not required; however, a qualified paleontologist should be contacted if fossils are discovered during construction, in order to salvage finds and assess the need for further mitigation

Source: Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995 and 2007.

SVP's guidelines also provide a working definition of *significance* as applied to paleontological resources. According to SVP, significant paleontological resources are those that fulfill one or more of the following criteria (Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995 and 2007).

- Provide important information shedding light on evolutionary trends and/or helping to relate living organisms to extinct organisms.
- Provide important information regarding the development of biological communities.
- Demonstrate unusual circumstances in the history of life.
- Represent a rare taxon or a rare or unique occurrence; are in short supply and in danger of being destroyed or depleted.
- Have a special and particular quality, such as being the oldest of their type or the best available example of their type.
- Provide important information used to correlate strata for which it may be difficult to obtain other types of age dates.

Significant paleontological resources may include vertebrate fossils and their associated taphonomic and environmental indicators; invertebrate fossils; and/or plant fossils.

Affected Environment

The information in this section is taken from the *I-80/I-680/SR 12 Interchange Project, Paleontological Sensitivity Analysi*s conducted for the proposed project in 2009.

Site Geology

Site geology is provided in Section 3.2.3, "Geology/Soils/Seismic/Topography," Figure 3.2.3-1 is a generalized geologic map of the project site, based on the work of Graymer et al. (2002).

Paleontological Sensitivity

Most of the project alternatives would be located on Holocene alluvial fan deposits (Qhf or Qhff) or levee deposits (Qhl) (Graymer et al. 2002) (Figure 3.2.4-1). These deposits are young and have low potential to contain paleontological resources (in contrast to older sediments of Pleistocene age), and there are no known records of vertebrate fossils in these deposits in Solano County (University of California Museum of Paleontology 2007). Although the alluvial fan deposits (Qhf) are not considered highly sensitive, they may overlie relatively shallow Pleistocene sediments that could be sensitive. The depth of the Holocene alluvial fan deposits ranges from approximately 0 to 25 feet.

The results of database and literature searches indicate that units are highly sensitive for paleontological resources. Table 3.2.4-2 summarizes paleontological resources and sensitivity of geological units in the project area.

Some of the western and southern portion of the project area is located in Late Pleistocene alluvial fan deposits (Qpf). Although there are no known fossils records from this deposit within Solano County, diverse vertebrate faunas have been collected from similar Pleistocene alluvial units in other parts of northern California. These deposits are sensitive for paleontological resources because they tend to contain vertebrate fossils. In addition, Pleistocene units containing nonmarine fossil are considered highly sensitive.

Outcrops of the Sonoma Volcanics (Tsvt and Tsva) occur in the western portion of the project area, west of Suisun Creek, and in the vicinity of the I-80/SR 12W interchange. Of the 69 records of vertebrate fossils in Solano County (University of California Museum of Paleontology 2007a), 29 are from the Sonoma Volcanics unit. These records include horse, deer, and unidentified mammals. The unit is sensitive for paleontological resources because it is known to contain vertebrate fossils.

The Markley Sandstone occurs on the western edge of the project area. This unit is a marine deposit containing bony fish (Osteichthyes) fossils, as well as gastropods and microfossils. The UCMP (2007a) database has no records of fossils from the Markley Formation in Solano County, but it does have four records of Osteichthyes in this unit in neighboring Contra Costa County. The unit is sensitive for paleontological resources because it contains vertebrate fossils (Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995).

Table 3.2.4-2. Preliminary Summary of Paleontological Resource Sensitivity for Geologic Units in the I-80/I-680/SR 12 Interchange Project Area[a]

Geologic Unit	Age	Fossil Content and Fossils	Solano County General Plan Background Report Description of Sensitivity[b]	Potential to Contain Significant Fossils
Artificial fill (af)	Historic	Deposits are artificial and will not contain fossils	Holocene alluvium does not contain paleontologically sensitive resources	No potential for fossils
Artificial fill over bay mud (afbm)	Historic	Deposits are artificial and will not contain fossils		No potential for fossils
Alluvial fan deposits (Qhf)	Holocene	No record of fossils in the project area; in general, these younger alluvial units do not contain significant vertebrate fossils		Low; however, it may form only a thin veneer over sensitive Pleistocene sediments (Graymer et al. 2002)
Fine-grained alluvial fan deposits (Qhff)	Holocene	No record of fossils in the project area; in general, these younger alluvial units do not contain significant vertebrate fossils		Low
Natural levee deposits (Qhl)	Holocene	No record of fossils in the project area; most likely no significant fossils in this unit		Low
Landslide deposits (Qls)	Holocene and Pleistocene	No record of fossils in the project area; these deposits are shed from the hills to the northwest; it is possible that landslide units of Pleistocene age could contain significant vertebrate fossils	Not applicable	Unknown and monitoring or detailed geologic mapping of this unit should occur
Allluvial fan deposits (Qpf)	Late Pleistocene	No record of fossils in the project area; however, diverse vertebrate faunas have been collected from other similar Pleistocene alluvial units in northern California; Pleistocene alluvial units tend to contain vertebrate fossils	Pleistocene alluvium is highly sensitive for paleontological resources	High
Sonoma Volcanics (Tsv) and ash-flow tuff (Tsvt)—subdivision of Sonoma volcanics	Pliocene and late Miocene	This unit is well known for its fossils; the UCMP (2007a) database includes 29 records of vertebrate fossils in this unit in Solano County alone; records are of unidentified mammals, one horse (*Equus occidentalis*), and deer (Cervidae)	Sonoma Volcanics are highly sensitive for paleontological resources	High
Markley Sandstone (Tmk)	Eocene	This unit is a marine deposit and contains bony fish (Osteichthyes) fossils, as well as gastropods and microfossils; no records of fossils from the unit in Solano County, but the UCMP (2007a) database contains four records of Osteichthyes (bony fishes) in neighboring Contra Costa County	Fossils commonly found in the Markley Formation are not highly sensitive because of their abundance, but there is potential for significant resources	High
Undivided sandstone, siltstone, and shale of the Great Valley complex (Ku)	Late Cretaceous	The UCMP database contains no records of fossils from the Great Valley complex (or sequence), and there is only one record of a Cretaceous fossil not assigned to a unit; however, strata of Great Valley complex in other areas are known to contain Cretaceous marine fossils, including invertebrates and marine reptiles (University of California Museum of Paleontology 2007b)		High

[a] Information is based on geologic formations identified in the project area from the geologic map of Graymer et al. (2002), UCMP database searches (2007), and a review of the *Solano County General Plan* (EDAW 2006).
[b] EDAW 2006.

Environmental Consequences

Impacts on paleontological resources were analyzed qualitatively, based on professional judgment. This analysis focuses on (1) identifying activities with the potential to disturb, damage, or destroy paleontological resources if any are present on the work site and (2) developing a strategy to ensure that mitigation requiring paleontological sensitivity assessment and appropriate treatment developed on a site-specific basis is in place for those activities identified as likely to result in damage.

Two factors are considered when evaluating a proposed project's potential to disturb or damage significant paleontological resources. First, most vertebrate fossils are rare and are therefore considered important paleontological resources. Second, unlike archaeological sites, which are narrowly defined, paleontological sites are defined by the entire extent (both areal and stratigraphic) of a unit or formation. In other words, once a unit is identified as containing vertebrate fossils or other rare fossils, the entire unit is a paleontological site (Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995 and 2007).

Because excavation can disturb or destroy paleontological resources, the potential for impacts on paleontological resources is based on the depth and extent of excavation and the paleontological sensitivity of the units. Figures 3.2.4-2, 3.2.4-3a and b, and 3.2.4-4a and b show areas where bridge work will occur and the area where excavation for the Red Top Road expansion will occur. These areas are overlain on the sensitivity of the geologic units for paleontological resources. Note that not all the ground in the bridge areas will be excavated (i.e., excavation for footings will occur in localized areas within the bridge areas), but the entire Red Top Road expansion area will be excavated. The figures evaluate the potential to encounter paleontological resources during excavation. Three designations are given to excavation:

- Excavation in areas with high potential for paleontological resources (i.e., areas of paleontologically sensitive high-potential units such as the Sonoma Volcanics and Late Pleistocene alluvial deposits, and areas with shallow low-potential units—Holocene deposits believed to be less than 15 feet thick—overlying high-potential units such as Late Pleistocene alluvial deposits).
- Excavation in areas with low potential for paleontological resources (i.e., Holocene deposits believed to be greater than 15 feet thick).
- Excavation in areas with unknown potential for paleontological resources (i.e., thickness of Holocene deposits is unknown).

Although Figures 3.2.4-2, 3.2.4-3a and b, and 3.2.4-4a and b provide more detailed information on the potential to encounter paleontological resources, the figures are approximate (i.e., they are not georectified and the exact boundaries and depths of geologic units is not known).

Destruction of Vertebrate or Otherwise Scientifically Significant Paleontological Resources as a Result of Construction Activities

Several units are sensitive for paleontological resources and fossils could be present in the project area. Figure 3.2.4-2, Figure 3.2.4-3a, and Figure 3.2.4-3b show the locations of the following sensitive units.

- Relatively shallow Pleistocene sediments that could be sensitive underlying Holocene alluvial fan deposits (Qhf), which range in depth from approximately 0 to 25 feet, in the central and eastern portion of the project area—the likelihood of encountering sensitive deposits increases with depth and with proximity to surficial exposures of sensitive deposits.
- Late Pleistocene alluvial fan (Qpf) deposits that are highly sensitive in the western portion of the project area—although there are no known fossils records from this deposit within Solano County, diverse vertebrate faunas have been collected from similar Pleistocene alluvial units in other parts of northern California. These deposits are sensitive for paleontological resources because they tend to contain vertebrate fossils.
- Outcrops of Sonoma Volcanics (Tsvt and Tsva) that are highly sensitive in the western portion of the project area, west of Suisun Creek, and in the vicinity of the I-80/SR 12W interchange—of the 69 records of vertebrate fossils in Solano County (University of California Museum of Paleontology 2007), 29 of them are from the Sonoma Volcanics unit, including horse, deer, and unidentified mammals (Table 3.2.4-2).

If fossils are present in the project area, they could be damaged during project construction. Substantial damage to or destruction of significant paleontological resources as defined by the SVP (Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995and 2007) would represent an impact.

The effect under Alternative C would be the same as under Alternative B but to a greater extent (Figure 3.2.4-2, Figure 3.2.4-4a, and Figure 3.2.4-4b). Table 3.2.4-3 compares the impacts of major excavation areas for Alternatives B and C on paleontological resources based on depth and extent of excavation and the paleontological sensitivity of the unit. Only project components that differ between alternatives are included. It should be noted, however, that both alternatives involve extensive, deep grading associated with the Red Top Road expansion in the paleontologically sensitive Markley Sandstone (Eocene), Sonoma Volcanics (Pliocene and late Miocene), and alluvial fan deposits (Late Pleistocene). It would not be possible to avoid paleontologically sensitive units in the project area because they are widespread. Any improvements involving excavation for bridge or overcrossing footings in the vicinity of the I-80/I-680 or I-80/SR 12W interchanges would, therefore, have the potential to affect significant paleontological resources.

Table 3.2.4-3. Comparison of Paleontological Impacts by Alternative

Project Component	Alternative B		Alternative C		Comment
	Activity	Sensitivity of Work Area	Activity	Sensitivity of Work Area	
New Interchange at SR 12W and I-80	Excavation of bridge footings excavated for improvements	High	Excavation of numerous bridge footings for new interchange and expansion	High	Alternative C involves many more footings and greater excavation area
Realignment of I-680	None	None	Grading	High	Alternative C involves extensive ground-disturbing activities
Improvements of I-80 and I-680	Grading for expanded interchange and excavation of footings for new bridge over Green Valley Creek	High to low	Excavation of footings for new bridge over Green Valley Creek	Low	Alternative B involves more extensive excavation, including excavation in a sensitive unit
New Single-Span Bridges over Green Valley Creek	None	None	Excavation of bridge footings	Low at surface but unknown at depth	
New Bridge at Suisun Creek	Excavation of bridge footings	Low	None	None	Alternative B would involve more excavation but only in low-sensitivity units
Truck Scale On-Ramp to Eastbound I-80	Excavation of bridge footings	Low at surface but unknown at depth	None	None	All impacts are related to Alternative B; impacts will depend on depth of excavation relative to depth of Holocene deposits
New Central Interchange					
Widened Bridge at Myer Lane over Ledgewood Creek					
New Overcrossing at Beck Avenue	None	None	Excavation of bridge footings for new overcrossing	Low at surface but unknown at depth	All impacts are related to Alternative C; impacts will depend on depth of excavation relative to depth of Holocene deposits

Notes: Project components common to both alternatives are not included in this table.
Alternative with greater impact is shaded.

The effect under the fundable first phases of the alternatives would be the same as the full-build alternatives but to a lesser extent, given the smaller project footprint and the smaller amount of excavation. Implementation of avoidance and minimization measures listed below would result in no adverse effect relating to destruction of vertebrate or otherwise scientifically significant paleontological resources under all build alternatives.

There would be no excavation or other ground disturbance under the No-Build Alternative. Therefore, there would be no potential for adverse effect relating to paleontological resources under the No-Build Alternative.

Avoidance, Minimization, and/or Mitigation

Avoidance or minimization would not be possible because paleontologically sensitive units in the project area are widespread. Any improvements involving excavation for bridge or

overcrossing footings in the vicinity of the I-80/I-680 or I-80/SR 12W interchanges would, therefore, have the potential to affect significant paleontological resources.

Mitigation measures that will be used to reduce project effects are described below. As part of the monitoring and mitigation strategy, further geotechnical data will be reviewed as they become available, and this information will be used to develop and refine an appropriate, effective, and feasible monitoring and mitigation strategy.

Conduct Preconstruction Surveys

The Department will conduct preconstruction studies to ensure that paleontological materials exposed at the surface are recovered and properly prepared and curated, or protected from damage using exclusion fencing or other appropriate means, and to further assess potential for impacts.

Educate Construction Personnel in Recognizing Fossil Material

The applicant will ensure that all construction personnel receive training provided by a qualified professional paleontologist experienced in teaching non-specialists, to ensure that they can recognize fossil materials in the event any are discovered during construction.

Retain a Qualified Professional Paleontologist to Monitor Ground-Disturbing Activities

In accordance with the Department's standard mitigation procedures for construction in units with the potential to contain fossils, the applicant will retain a qualified professional paleontologist as defined by the Department's Standard Environmental Reference and the Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee (1995 and 2007) to monitor activities with the potential to disturb units sensitive for paleontological resources. Data gathered during preconstruction surveys for paleontological resources, and detailed project design, will be used to determine the activities that will require the presence of a monitor. In general, these activities include any ground-disturbing activities involving excavation in areas with high potential to contain fossils or excavation deeper than three feet in areas with low or unknown potential to contain fossils. Recovered fossils will be prepared so that they can be properly documented. Recovered fossils will then be curated at a facility that will properly house and label them, maintain the association between the fossils and field data about their provenance, and make the information available to the scientific community.

Stop Work and Conduct Appropriate Treatment if Substantial Fossil Remains Are Encountered During Construction

In accordance with the Department's standard mitigation procedures for construction in units with the potential to contain fossils, when requested by the paleontological monitor, earth-disturbing activities will be stopped in an area or diverted to allow for the safe recovery of fossil specimens. Additionally, if construction personnel observe fossils in an area where paleontological resources were not anticipated and paleontological monitors are therefore not present, earth-disturbing activities will be stopped until the material can be evaluated by a monitor and appropriate treatment taken. Recovered fossils will be prepared so that they can be

properly documented. Recovered fossils will then be curated at a facility that will properly house and label them, maintain the association between the fossils and field data about their provenance, and make the information available to the scientific community. The applicant will be responsible for ensuring that monitor's recommendations regarding treatment and reporting are implemented.

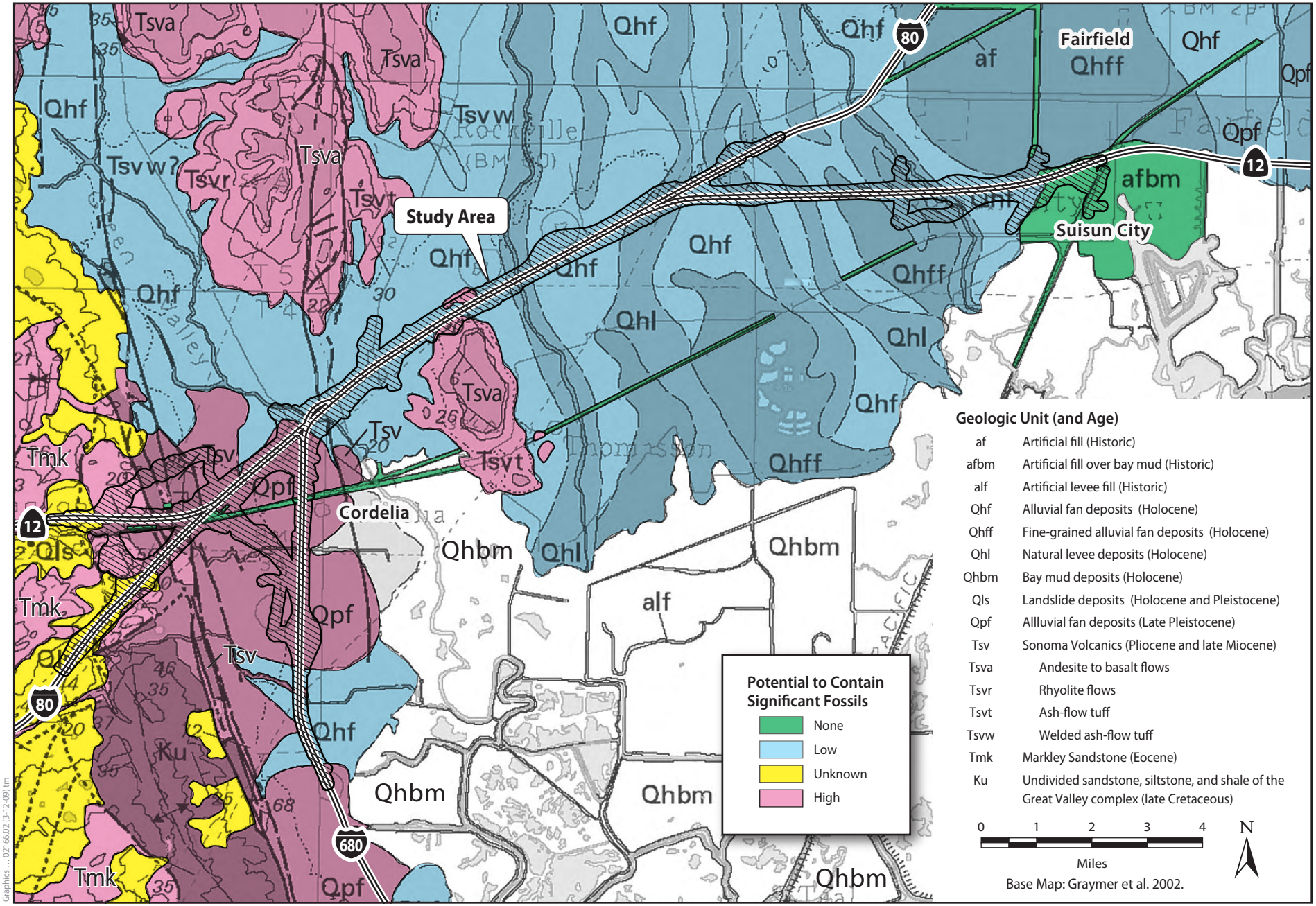


Figure 3.2.4-1
Paleontological Sensitivity Map of the Project Area

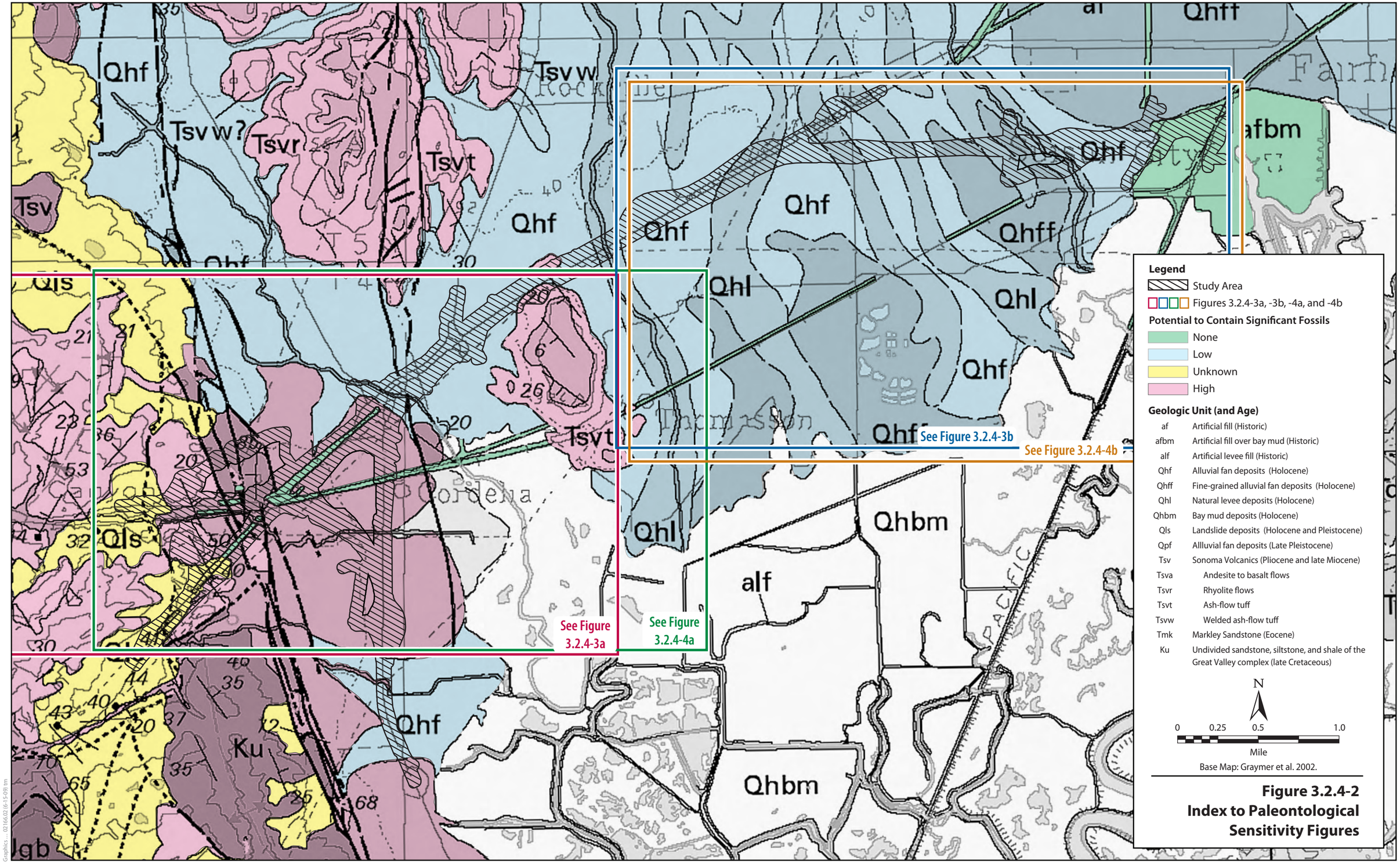


Figure 3.2.4-2
Index to Paleontological Sensitivity Figures

Alternative B Continued on Figure 3.2.4-3b

Improved Interchange at I-80 and Suisun Valley Road

New Single Span Bridge over Dan Wilson Creek

Improved Interchange at I-80 and Green Valley Road

New Single Span Bridges over Green Valley Creek

New Roadway Connecting Red Top Road Interchange with Business Center Drive

New Interchange at Red Top Road and SR 12W

Improved/Expanded Interchange at I-80 and I-680 (with HOV Lane Conectors)

Improved/Expanded Interchange at SR 12W and I-80

New Interchange at I-680 and Red Top Road

Legend

- Bridge Area*
- Red Top Road Expansion Area*

* Note: Excavation for footings will occur in localized areas within the bridge areas (i.e., not all the ground in the bridge areas will be disturbed), but deep excavation will occur in the entire Red Top Road expansion area.

Potential to Contain Significant Fossils

- None
- Low
- Unknown
- High

Potential to Disturb Paleontological Resources

- H — High
- L — Low
- L/U — Low near Surface, but Unknown at Greater Depth

See Figure 3.2.4-1 for List of Geologic Units

N

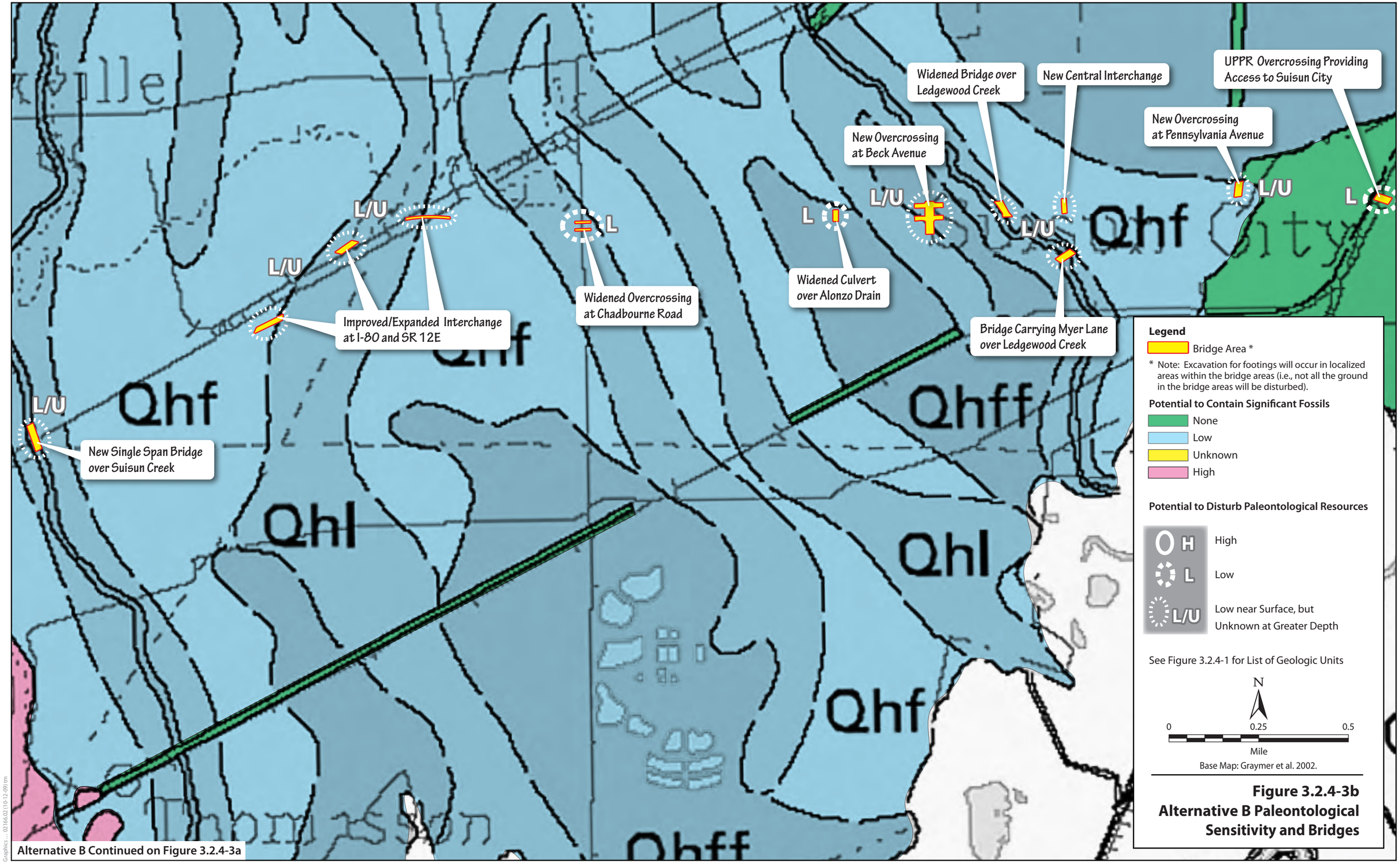
0 0.25 0.5

Mile

Base Map: Graymer et al. 2002.

Figure 3.2.4-3a
Alternative B Paleontological Sensitivity and Bridges

Graphics - 02166.02 (10-12-09).trn



Alternative B Continued on Figure 3.2.4-3a

Figure 3.2.4-3b
Alternative B Paleontological Sensitivity and Bridges

Alternative C Continued on Figure 3.2.4-b

Improved Interchange at Suisun Valley Road and I-80

New Single Span Bridge over Dan Wilson Creek

Improved Interchange at I-80 and Green Valley Road

New Single Span Bridges over Green Valley Creek

New Roadway Connecting I-80/Red Top Road Interchange and Business Center Drive

New Interchange at I-80/I-680/SR 12W

New Interchange at Red Top Road and SR 12W

Realignment of I-680 to Connect with SR 12W/I-80 Interchange

Improved Interchange at I-80 and Red Top Road

New Interchange at I-680 and Red Top Road

Legend

Bridge Area*

Red Top Road Expansion Area*

* Note: Excavation for footings will occur in localized areas within the bridge areas (i.e., not all the ground in the bridge areas will be disturbed), but deep excavation will occur in the entire Red Top Road expansion area.

Potential to Contain Significant Fossils

- None
- Low
- Unknown
- High

Potential to Disturb Paleontological Resources

- H — High
- L — Low
- L/U — Low near Surface, but Unknown at Greater Depth

See Figure 3.2.4-1 for List of Geologic Units

N

0 0.25 0.5

Mile

Base Map: Graymer et al. 2002.

Figure 3.2.4-4a
Alternative C Paleontological Sensitivity and Bridges

Improved/Expanded Interchange at I-80 and SR 12E

Widened Overcrossing at Chadbourne Road

Widened Culvert over Alonzo Drain

New Overcrossing at Beck Avenue

Widened Bridge over Ledgewood Creek

New Overcrossing at Pennsylvania Avenue

UPPR Overcrossing Providing Access to Suisun City

L/U

L

L

L/U

L/U

L

Qhf

Qhf

Qhff

Qhl

Qhl

Qhf

Qhff

Legend

Bridge Area *

* Note: Excavation for footings will occur in localized areas within the bridge areas (i.e., not all the ground in the bridge areas will be disturbed).

Potential to Contain Significant Fossils

None

Low

Unknown

High

Potential to Disturb Paleontological Resources

H — High

L — Low

L/U — Low near Surface, but Unknown at Greater Depth

See Figure 3.2.4-1 for List of Geologic Units

N

0 0.25 0.5

Mile

Base Map: Graymer et al. 2002.

Figure 3.2.4-4b
Alternative C Paleontological Sensitivity and Bridges

Alternative C Continued on Figure 3.2.4-4a

3.2.5 Hazardous Waste/Materials

Regulatory Setting

Hazardous materials and hazardous wastes are regulated by many state and federal laws. These include not only specific statutes governing hazardous waste, but also a variety of laws regulating air and water quality, human health and land use.

The primary federal laws regulating hazardous wastes/materials are the Resource Conservation and Recovery Act of 1976 (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). The purpose of CERCLA, often referred to as Superfund, is to clean up contaminated sites so that public health and welfare are not compromised. RCRA provides for "cradle to grave" regulation of hazardous wastes. Other federal laws include:

- Community Environmental Response Facilitation Act (CERFA) of 1992
- Clean Water Act
- Clean Air Act
- Safe Drinking Water Act
- Occupational Safety and Health Act (OSHA)
- Atomic Energy Act
- Toxic Substances Control Act (TSCA)
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

In addition to the acts listed above, Executive Order 12088, Federal Compliance with Pollution Control, mandates that necessary actions be taken to prevent and control environmental pollution when federal activities or federal facilities are involved.

Hazardous waste in California is regulated primarily under the authority of the federal Resource Conservation and Recovery Act of 1976, and the California Health and Safety Code. Other California laws that affect hazardous waste are specific to handling, storage, transportation, disposal, treatment, reduction, cleanup and emergency planning.

Worker health and safety and public safety are key issues when dealing with hazardous materials that may affect human health and the environment. Proper disposal of hazardous material is vital if it is disturbed during project construction.

The California Health and Safety Code, Hazardous Waste Control

The Hazardous Waste Control Act (HWCA) regulates the generation, treatment, storage, and disposal of hazardous waste. Hazardous waste is any material or substance that is discarded, relinquished, disposed of, or burned, or for which there is no intended use or reuse, and the material or substance causes or significantly contributes to an increase in mortality or illness; or the material or substance poses a substantial present or potential hazard to human health or the environment. These materials or substances include spent solvents and paints (oil and latex), used oil, used oil filters, used acids and corrosives, and unwanted or expired products (pesticides, aerosol cans, cleaners, etc.). If the original material or substance is labeled Danger, Warning, Toxic, Caution, Poison, Flammable, Corrosive or Reactive, the waste is very likely to be hazardous.

The California Health and Safety Code, Underground Storage Tank Regulations

Chapter 6.7 of the Health and Safety Code outlines the requirements for USTs, identifies requirements for corrective actions, cleanup funds, liability, and the responsibilities of owners and operators of USTs.

Solano County, Environmental Health Services Division, Certified Unified Program Agency

The Solano County Department of Resource Management, Environmental Health Services Division is the Certified Unified Program Agency (CUPA) for all cities and unincorporated areas within Solano County. The CUPA is a single local agency designated by the California Environmental Protection Agency as having regulatory authority for eight environmental programs. These programs are Hazardous Materials Business Plan, Hazardous Waste, California Accidental Release Prevention (Risk Management Plan), Aboveground Storage Tanks, Underground Storage Tanks, Emergency Response, Waste Tire Program, and Illegal Disposal/Complaints. The Solano County CUPA enforces those programs throughout the County. In addition to the CUPA Program, staff responds whenever there is an accidental release of hazardous materials.

In addition, the State Water Resources Control Board has contracted with the County of Solano to provide regulatory oversight for the cleanup of leaking underground storage tanks (LUSTs) under Local Oversight Program (LOP) contract. The programs service all the cities and unincorporated areas of Solano County.

The site cleanup program oversees the voluntary cleanup of contaminated property. Sections 101480 through 101490 of the California Health and Safety Code provide that a Responsible Party (RP) for a release site may request oversight of a site investigation and any remediation necessary to mitigate the site. Oversight activities include any review required of site assessment and remediation workplans, review of required sampling operations, analysis of sampling data, and establishment of site cleanup criteria. The RP can initiate oversight by submitting a written request for oversight. Once the signed agreement is received, the Environmental Health Services Division is required to notify the California Department of Toxic Substances Control (DTSC) and the applicable Regional Water Quality Control Board (RWQCB) to determine if these agencies have regulatory involvement with the site. If no concerns are raised by the State agencies, then a staff person of the Environmental Health Services Division Hazardous Materials

Section will oversee the investigation and remediation of the site. After determining that the RP has completed the site investigation and remediation necessary to protect human health and the environment then, Environmental Health Services Division Hazardous Materials Section will prepare a no-further-action "closure" letter stating that the investigation and remediation is complete.

Asbestos Regulations

Title 8 California Code of Regulations Section 1529 regulates asbestos exposure in all construction work and defines permissible exposure limits and work practices. Typically, removal or disturbance of more than 100 square feet of material containing more than 0.1% asbestos must be performed by a registered asbestos abatement contractor, but associated waste labeling is not required if the material contains 1% or less asbestos. When the asbestos content of materials exceeds 1%, virtually all requirements of the standard become effective. With respect to potential worker exposure, notification, and registration requirements, the California Division of Occupational Safety and Health (Cal/OSHA) defines asbestos-containing construction material (ACCM) as construction material that contains more than 0.1% asbestos (8 CCR 341.6).

Affected Environment

The project consists of the project footprint and surrounding land in the vicinity of Fairfield and Suisun City, Solano County, California. The approximate site location is depicted on Figure 2-1. The specific site reconnaissance for this analysis are described in detail below.

Initial Site Assessment Reports

The information below is summarized from *Initial Site Assessment, I-80, I-680, SR-12 Improvement Project, Solano County* (ISA) prepared in 2008 and updated in 2009. The ISA reports were prepared in accordance with the Department's *Initial Site Assessment Guidance* in order to determine the presence of hazards and hazardous materials within the project right-of-way and temporary construction easements.

The ISA reports included the following:

- Reviews of previously prepared environmental reports, Draft Private Property Investigation and Aerially-Deposited Lead Report. These reports document potential environmental concerns within the Department's right-of-way and properties adjacent to the proposed project.
- Review of physical setting references and observations made to obtain information concerning the topographic, geologic, and hydrogeologic characteristics of the site and vicinity.
- Summary of a site reconnaissance conducted from public thoroughfares to observe conditions and activities for indications of evidence of recognized environmental conditions.
- Review of historical sources (including prior environmental reports, aerial photographs, and topographic maps) to develop a site history detailing previous uses of the site and the surrounding area to identify potential past uses that might have led to recognized environmental conditions.

- Review of publicly available federal, state, and local regulatory agency records to help identify recognized environmental conditions at or potentially affecting the site.

The information obtained for the ISA reports is relevant only for the dates of the records reviewed or as of the date of the latest site visit. Therefore, the information is valid only as of the date of the reports. Due to the lack of sufficient right-of-entry permits, site reconnaissance of private parcels and property owner interviews were not performed.

The ISA reports are not a comprehensive site characterization and should not be construed as such. The findings and conclusions presented are predicated on the site reconnaissance, a review of the historical usage of the site, and a review of the specified regulatory records as presented in the ISA. It should be noted that wetlands delineation and surveys of asbestos, lead-containing paint (non-bridge) structure, lead in drinking water, radon, methane gas, and mold were not included in the scope of services for these reports. Therefore, the ISA reports should be deemed conclusive only with respect to the information obtained.

Site Reconnaissance

Site reconnaissance of the project area was performed in April 2008 and April 2009. The purpose of the reconnaissance was to survey the existing I-80/I-680/SR 12 corridors, adjacent roadway connector and private property conditions within and adjacent to the area from public thoroughfares to attempt to identify visual indicators of potential hazardous waste facilities/impacts. The site reconnaissance excludes the segment of eastbound I-80 from SOL PM 14.0 to 15.7 and eastbound SR 12E from SOL PM L1.8 to L2.0, the eastbound I-80 Truck Inspection Facility, and portions of adjacent property south of I-80.

Aerially Deposited Lead Report

Aerially deposited lead (ADL) in soils adjacent to highways is attributed to the historic use of leaded gasoline. Areas of primary concern are soils along routes that have had high vehicle emissions from large traffic volumes or congestion during the time period when leaded gasoline was in use (generally prior to 1986). Typically, ADL is found in the top two feet of material in areas within the highway right-of-way. Soils within the Department's right-of-way that contain hazardous waste concentrations of ADL can be reused under the authority of variances issued by the DTSC. The variances allow stockpiling, transporting, and reusing soils with concentrations of lead below maximum allowable levels on the Department's right-of-way when specific conditions are met.

The ADL report for the I-80 Eastbound Cordelia Truck Scale Relocation Project (a nearby project) is summarized in the 2009 ISA update. ADL investigation of the Department's right-of-way consisting of the eastbound shoulder of I-80, from PM 10.0 to 15.7, and eastbound SR 12E from PM L1.8 to L2.0 were performed. A total of 105 soil samples were collected for lead analysis. Additionally, 20 step-out borings were advanced and 24 soil samples were collected. Soil samples were collected from the step-out borings at selected depths between the surface and 2.5 feet, and were based upon the depth intervals where reported soluble lead concentrations (using the waste extraction test [WET]) exceeded the soluble threshold limit concentration (STLC) of 5.0 milligrams per liter (mg/l) in the corresponding initial samples. Soil analytical results and the lead statistical evaluation of the initial borings indicated the following.

- Shallow soil at the western and eastern portions of the project area would not be classified as a California hazardous waste because the 90% upper confidence limit (UCL) predicted soluble WET lead concentration is less than the lead STLC of 5.0 mg/l.
- The top one foot of soil excavated from the central portion of the area investigated should be either (1) managed and disposed of as a California (but not an RCRA—i.e., Federal) hazardous waste or (2) stockpiled and re-sampled to confirm waste classification in accordance with specific disposal facility acceptance criteria, if applicable. Underlying soil would not be classified as hazardous waste based on lead content. Based on the results of the step-out borings, the ADL impacts at hazardous-waste levels do not appear to extend further than 12 feet from the edge of pavement (EOP).
- Analytical results of the step-out boring soil samples did not report soluble WET lead at concentrations above the STLC of 5.0 mg/l. Therefore, soil excavated from areas greater than approximately 12 feet from the EOP (approximately ten feet from the initial borings) and generated for offsite disposal should not be classified as a California hazardous waste based on lead content.

Environmental Data Resources Database Search

Environmental Data Resources (EDR) performed a search of federal, state, and local databases for the project footprint and the surrounding area (Appendix E in the 2008 ISA). The following sections provide additional information regarding properties with potential hazardous materials located within approximately 0.25 mile of the project footprint.

Maps depicting the ISA study area and potential hazardous waste facilities are presented in Figures 3.2.5-1 through 3.2.5-9. Table 3.2.5-1, located at the end of this section, identifies potential hazardous waste facilities along with their respective Map ID numbers and potential impact (low and moderate risk) on right-of-way acquisition and build alternatives selection.

According to information presented in the Department of Conservation Division of Mines and Geology map, naturally occurring asbestos is not indicated in the project footprint or in the vicinity of the project (California Department of Conservation 2000).

Emergency Response Notification System

The Emergency Response Notification System (ERNS) records and stores information on reported releases of oil and hazardous substances. Two ERNS sites are within the search area for the proposed project.

- Emergency Response Notification System (ERNS) listing for Eastbound I-80 and I-680 overpass—In December 1988, approximately 100 gallons of gasoline spilled from an overturned tanker truck into Green Valley Creek.
- ERNS listing for I-680 and 80 interchange—In January 1991, an overturned fuel tanker caught fire and spilled approximately 7,200 gallons of diesel, affecting soil and surface water in Green Valley and Dan Wilson Creeks.

LUST and Spills, Leaks, Investigation, and Cleanup Listings

Review of the EDR search report indicates that 19 facilities in the vicinity of the project area are referenced on the LUST and/or Spills, Leaks, Investigation, and Cleanup (SLIC) listings. Two

sites appear to be associated with property to be potentially acquired by the Department as part of the proposed improvement project, and include the following:

- **The Valine property at 4000 Russell Road in Fairfield.** Based on subsequent soil and groundwater sample results, the Solano County Department of Resource Management granted case closure on June 11, 2008.
- **The 76 station (formerly Unocal) at 119 Red Top Road in Fairfield.** The County Department of Resource Management granted UST case closure on August 25, 1997.

Table 3.2.5-2 provides a summary of LUST and SLIC cases within the project vicinity that are currently open.

Table 3.2.5-2. LUST and SLIC Properties

Map ID No.	Name	Address	Substance	Affected Media	Status
6	PrimeSource Inc./ Sequoia Supply	250 Dittmer Road	Gasoline, MTBE	Soil and Groundwater (Drinking water aquifer)	Verification Monitoring
33	Canova Moving and Storage	1336 Woolner Avenue	Gasoline, MTBE, BTEX	Soil and Groundwater, possible utility migration	Remediation
36	Sheldon Oil Co.	526 School Street	Not Reported	Soil and Groundwater	Open LUST and SLIC case; Remediation

Source: ISA Update, Solano County, 2009.

UST/AST Listings

The EDR search report indicates that 12 facilities at and in the vicinity of the project study area contain registered USTs or ASTs. Many of these facilities are also included in the LUST listings. A review of the listings indicates that two of the registered UST facilities are located at properties proposed for full or partial Department acquisition as part of the proposed improvement project: the 76 Station at 119 Red Top Road in Fairfield (UST case closed), and Super Store #70567 Industries at 199 Red Top Road in Fairfield (no pending actions or violations).

RCRA SQG, FINDS and HAZNET Listings

There are 18 facilities at or in the vicinity of the project study area that are referenced on the RCRA Small and Large Quantity Generator (SQG and LQG) listings as generating between 100 and 1,000 kilograms and greater than 1,000 kilograms, respectively, of hazardous waste per month. There are 18 facilities listed in the Facility Index System (FINDS) from cross reference to other regulatory listings relating to chemical use, storage, and disposal, and 23 facilities at or in the vicinity of the project study area are referenced in the HAZNET listing for filing hazardous waste manifests.

The EDR Orphan Summary identifies properties that have incomplete address information and could not be specifically plotted. A total of 49 properties were listed in the Orphan Summary. Approximately four of the properties listed on the Orphan Summary are located within the project study area and have been incorporated in the prior regulatory listing summaries. None of these properties, however, are properties proposed for acquisition (copies of the EDR Orphan Summary and individual EDR Site Reports for the listed facilities are presented in Appendix B in the ISA Update).

Environmental Consequences

The ISA reports identified the following potential hazardous materials/waste conditions.

- **Effects associated with nearby agricultural uses:**
  - Soil impacts associated with pesticides, herbicides, petroleum hydrocarbons, and metals from agricultural use. Pesticides appear to be present in surface soil in the central and eastern portions of the proposed project area and the Suisun Creek Bridge area.
- **Other soil effects:**
  - Contaminated soil associated with leaking storage tanks and sanitary sewer pipelines.
  - Groundwater in the eastern portion of the proposed project area and the Suisun Creek Bridge area appears to be affected by pesticides. Potential impacts may be associated with construction of bridge pilings greater than ten feet deep.
- **Effects associated with traffic or roadway maintenance:**
  - ADL at levels exceeding hazardous waste criteria have been identified within the unpaved shoulders and median within existing I-80 right-of-way in the central and eastern portions of the project area.
  - Lead-containing paint (LCP) associated with removal of existing yellow pavement striping.
- **Potential effects associated with the removal or modification of facilities or structures:**
  - Sulfur from bridge rail posts may be encountered during demolition.
  - LCP may be encountered during demolition.
  - Treated-wood waste may be encountered during demolition.
  - Asbestos-containing pipe may be encountered during demolition.
- **Effects associated with identified potential hazardous waste facilities:**
  - Past residual petroleum hydrocarbon releases may require additional UST removal and soil and groundwater remediation.

ADL is present in the surface and near-surface soils as a result of past emissions from vehicles powered by leaded gasoline. Yellow thermoplastic and paint striping, potentially containing lead chromate, is present on roadway surfaces within the project area. Structures within the existing Department rights-of-way and those present proposed for full or partial Department acquisition may contain ACMs and LCPs. Potential LCP and ACMs also may be present in bridge construction materials within the project area.

Soil sampling and analysis to evaluate ADL in shallow soil within the existing eastbound I-80 right-of-way indicates that the top one foot of soil in the central portion of the project area would be classified as hazardous waste based on lead content.

Soil sampling and analysis to evaluate properties being considered for right-of-way acquisition was conducted. Results indicate elevated levels of arsenic, vanadium, pesticides, and dieldrin exceeding acceptable residential, commercial, and industrial ESLs.

Exposure of Humans and the Environment to Groundwater Contamination as a Result of Construction Activities

As previously discussed, Table 3.2.5-1 identifies potential hazardous waste facilities along with their respective Map ID numbers and potential impact to right-of-way acquisition and build alternatives selection. Eight facilities located within the project area are considered moderate-risk. Five of these have documented groundwater contamination and as such, are considered high-risk facilities. All eight of the medium/high risk sites are located within or adjacent to the footprints of both alternatives and therefore would not influence the selection of one alternative over another. Although some of these cases are considered closed, testing for contaminants should be conducted in order to determine the extent and nature of possible contamination.

Under the No-Build Alternative, there would be no construction and therefore, no potential to expose workers or nearby land uses to hazardous materials as a result of construction activities.

Potential for Exposure of Construction Workers or Nearby Land Uses to Previously Unknown Hazardous Materials as a Result of Construction Activities

The project area generally has a moderate risk of previously unreported hazardous materials that could be discovered during construction of any of the build alternatives. The development of a health and safety plan would address this potential hazard.

Under the No-Build Alternative, there would be no construction and therefore, no potential to expose workers or nearby land uses to hazardous materials as a result of construction activities.

Potential for Exposure of Known Hazardous Materials to Humans or the Environment as a Result of Construction Activities

The project area generally has the potential for hazardous materials in the form of heavy metals, such as chromium and lead in yellow pavement striping; ACMs; soils contaminated with pesticides, herbicides, and metals; treated-wood waste; bridge rail post sulfur; bridge pilings; and petroleum hydrocarbons that could be released during construction of any of the build alternatives unless measures are taken to avoid that release. In addition, the ADL investigation report in the ISA Update confirmed the presence of ADL within the project area.

Other potential sources of contamination include aerially applied chemicals during agricultural use of adjacent parcels that could present a respiratory irritant to construction workers. Construction may require the movement or disposal of soils or materials containing some or all of these hazardous materials. Implementation of measures relating to the handling of yellow striping, contaminated soils, sampling ground water, and to timing of construction will avoid these potential adverse effects.

Under the No-Build Alternative, no construction would occur and therefore, there would be no potential to expose any known hazardous materials during construction.

Potential for Exposure of Humans and the Environment to Hazardous Conditions from the Accidental Release of Hazardous Materials as a Result of Construction Activities

Construction would involve the use of heavy equipment, small quantities of hazardous materials (e.g., petroleum and other chemicals used to operate and maintain construction equipment), and larger quantities of potentially hazardous road construction materials (i.e., blacktopping materials) that may result in hazardous conditions in the project area. In addition, sanitary sewer pipelines may cross or exist within the planned roadway construction alignment. If pre-existing leaks are encountered, or if pipelines are ruptured during construction, construction workers or nearby land uses could be exposed to biological contamination. These hazards are applicable to any of the build alternatives. The development of a health and safety plan would avoid and minimize this potential effect.

Under the No-Build Alternative, no construction would occur and therefore, there would be no potential for an accidental release of hazardous materials as a result of construction activities.

Avoidance, Minimization, and/or Mitigation Measures

Perform Groundwater Contamination Testing

Five sites identified in Table 3.2.5-1 have documented groundwater contamination issues and as such, are considered high-risk facilities. Although some of these cases are considered closed, testing for contaminants should be conducted in order to determine the extent and nature of possible contamination.

Therefore, subsequent to the public circulation of the draft environmental document, testing will be performed on those parcels that are affected by the selected alternative, provided that a right of entry to perform the testing can be obtained.

Develop a Health and Safety Plan to Address Worker Health and Safety

The location of underground pipeline crossings will be determined by the Underground Service Alert (USA) system for excavation work at these pipeline crossings before construction. Soil testing for contamination will be conducted prior to construction work. Soils within the Department's right-of-way that contain hazardous waste concentrations of ADL can be reused under the authority of variances issues by the California DTSC. These variances include stockpiling, transporting, and reusing soils with concentrations of lead below maximum allowable levels on the Department's right-of-way when specific conditions are met. As necessary, a health and safety plan will be prepared to address worker safety when working with potentially hazardous materials, including biological contaminants, potential LCPs, soils potentially containing ADL, and other construction-related materials within the right-of-way for any soil disturbance.

Conduct Sampling, Testing, Removal, Storage, Transportation, and Disposal of Yellow Striping along Existing Roadways

The Department will ensure that before construction, the contractor will sample and test yellow pavement striping scheduled for removal to determine whether lead is present. All aspects of the proposed project associated with removal, storage, transportation, and disposal will be in strict accordance with appropriate regulations of the California Health and Safety Code. Disposal of the stripes will be at a Class 1 disposal facility. The responsibility of implementing this measure will be outlined in the contract between the Department and the contractor.

Dispose of Soils Contaminated with ADL, Arsenic, Pesticides, and Herbicides in Accordance with Appropriate Regulations

Based on the results of the 2008 ADL investigation report summarized in the 2009 ISA, soils in the central and eastern portions of the project area are classified as hazardous waste. This soil will be handled or disposed of in accordance with the California Health and Safety Code DTSC requirements. Under the DTSC Variance, this soil may be reused onsite if the excavated soil is placed under clean fill or pavement and a minimum of five feet above the maximum water table elevation. Consultation and a permit from the Solano County CUPA will be obtained before reusing any contaminated soil. The CUPA will consult with the DTSC regarding any further requirements.

Based on the elevated arsenic, lead, and pesticides concentrations reported in soil samples from the upper 2.5 feet of soil at the private property parcels, the top 2.5 feet of excavated soil can be reused within the project limits by placing the soil beneath a minimum of one foot of clean fill or beneath a pavement structure. If reuse conditions are not met, material will be transported to the Class 1 disposal site at Kettleman City.

Time Construction to Avoid Exposure of Construction Workers to Respiratory Irritants from Aerially Applied Chemicals

The Department will ensure that the contractor coordinates the timing of construction activities with individual growers on parcels within or adjacent to the project area to avoid any aerially applied chemical impacts on workers during construction.

Sampling and Testing of Groundwater

Groundwater sampling within the Suisun Creek Bridge vicinity of the project area should be performed to further evaluate potential contamination. Sampling and testing for contamination will be conducted during construction activities that require excavation deeper than four feet. Groundwater containing contaminates will be treated to reduce sediment load and metal content prior to discharge to surface water bodies or publicly owned treatment facilities.

Table 3.2.5-1. Summary of Identified Potential Hazardous Waste Facilities and Recommendations

Table 3.2.5-1
SUMMARY OF IDENTIFIED POTENTIAL HAZARDOUS WASTE FACILITIES AND RECOMMENDATIONS
I-80/I-680/SR-12 IMPROVEMENT PROJECT

Map ID No.	Facility	Address	APN	Impact to ROW and Acquisitions	Information Source(s)	Environmental Impacts/ Chemical of Concern	Regulatory Status	Potential Impact to I-80/I-680/SR-12 Improvement Project and Recommendations
1	Tower Mart	4720 Gold Hill Road		Low Impact Alt B and C ESA	EDR Report LUST	Active service station located west of the project ESA. Based on information presented in the EDR report, this facility was listed in the LUST database for petroleum hydrocarbon impacts to soil only.	The facility is listed with a "case closed" status from the SCDRM.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
2	**76 Station**	**119 Red Top Road**	**0180-01-0070**	**Moderate Impact Alt B and C ESA**	**Recon LUST SCDRM Files**	**Active service station located within the project ESA. USTs were removed in 1995. A leak in a waste oil UST was discovered and petroleum-impacted soil excavated. Confirmation soil samples did not contain detectable levels of contaminants. Low levels of BTEX reportedly remain in soil at a depth of 4.5 feet along the former product piping trenches. Groundwater not encountered in the excavation and the SCDRM indicates impacts to soil only. Replacement USTs reportedly subsequently installed at the facility.**	**This facility was granted UST case closed status from the SCDRM in August 1997.**	**This facility presents a moderate risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries. A partial or full parcel take may require UST removals, and additional soil and groundwater characterization and remediation. from past petroleum hydrocarbon releases. Exploratory borings should be performed for any planned construction excavations on and adjacent to this facility to evaluate worker health & safety and soil disposal options.**
3	Sunnyside Farms	199 Red Top Road	0180-01-0050	Low Impact Alt B and C ESA	Recon LUST SCDRM Files	The facility is currently a food distribution facility within the project ESA. Three USTs abandoned in place in 1989. Confirmation sample results were not included in SCDRM files. Three diesel ASTs reported at the facility. A fourth diesel UST and fuel dispensers removed in 2004 under SCDRM supervision. Contaminants not detected in confirmation soil samples. Groundwater was not encountered during closure activities.	No pending regulatory action or active violations were noted in SCDRM files for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries. Exploratory borings should be performed if partial or full parcel take is contemplated to evaluate potential site impacts related to petroleum hydrocarbon releases from past UST and current AST operations.
4	Jack-in-the-Box (Former Red Top Mini Market)	107 Red Top Road (formerly 151 Red Top Road)	0180-01-0080	Low Impact Alt B and C ESA	LUST SCDRM Files 1970 Aerial	Currently a fast-food restaurant (formerly a service station) within the project ESA. One UST failed a leak test in 1986, and three USTs removed in 1987. Petroleum impacts to soil and a limited amount of soil was excavated during the UST removal. A 1996 site characterization found TPHg and low levels of BTEX in 2 of the 30 soil samples collected at 10 ft. Soil samples at the 20 foot depth from the same borings did not contain detectable levels. Water samples collected from borings within the former UST excavation contained low levels of TPHg and BTEX. Additional impacted soil and groundwater were removed from the property for offsite disposal. Contaminants were reportedly not detected in confirmation soil samples.	This facility was granted a case closed status from the SCDRM in November 1996.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
5	United Parcel Service	5000 West Cordelia Road		Low Impact Alt C ESA	Recon UST	Active UPS parcel distribution facility within the project ESA. The UPS facility was listed in the EDR report in the UST database for operation of one UST at the facility. No case files at the SCDRM for this property and no releases indicated in the EDR report.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternative C based on proposed construction area boundaries.
6	Prime Source	250 Dittmer Road		Low Impact Alt C ESA	LUST GeoTracker	The facility is an active automobile re-seller. One UST removed in 1988. Petroleum-impacted soil was encountered in the tank pit. A replacement diesel UST was installed at the same location later that year. In 1997, a motor oil UST was abandoned in place under the supervision of SCDRM. In 2005, both USTs removed. Impacted soil and groundwater were identified and the area over-excavated. Contaminants were not detected in confirmatory soil samples, though were in groundwater. Additional borings and monitoring wells installed and soil excavated. Low levels of TPHd remain in onsite groundwater.	SCDRM is evaluating consultants request for No Further Action status for the facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternative C based on proposed construction area boundaries.
7	Arco Station	105 Lopes Road		Low Impact Alt B and C ESA	Recon UST	Active gas station with no reported releases or violations. The facility was observed in the field during the site reconnaissance and was not included in the EDR Report.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
8	Napa Valley Beverage Company	497 Edison Court		Low Impact Alt C ESA	Recon SCDRM Files LUST	Two USTs removed in 1989. Low levels of contaminants encountered in soil from the tank pit. SCDRM required installation of monitoring wells. Onsite soil remediation conducted in 1990. In August 1994, a groundwater sample from near the former UST excavation contained low levels of TPHd.	This facility was granted a case closed status from the SCDRM in August 1995.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternative C based on proposed construction area boundaries.

Source: Geocon Consultants. 2009. I-80/I-680/SR 12 Improvement Project, Fairfield and Suisun City, Solano County, California, Initial Site Assessment Update. Prepared for U.S. Department of Transportation, Federal Highways Administration, State of California, Department of Transportation. April 2009

Table 3.2.5-1
SUMMARY OF IDENTIFIED POTENTIAL HAZARDOUS WASTE FACILITIES AND RECOMMENDATIONS
I-80/I-680/SR-12 IMPROVEMENT PROJECT

Map ID No.	Facility	Address	APN	Impact to ROW and Acquisitions	Information Source(s)	Environmental Impacts/ Chemical of Concern	Regulatory Status	Potential Impact to I-80/I-680/SR-12 Improvement Project and Recommendations
9	Hudson Beverage Company	237 Lopes Road		Low Impact Alt B and C ESA	Recon SCDRM Files LUST	The facility is a commercial business. Two USTs removed 1997. Impacts soil and groundwater were encountered and over-excavation and removal of groundwater conducted. Confirmation soil and groundwater samples also showed residual petroleum impacts. In 2000, two USTs closed in place. In October 2000, sampling defined the extent of impact to a localized area near the former UST pit.	This facility was granted a case closed status from the SCDRM in March 2001.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
10	Sierra Truck and Van (Formerly Trail Wagons)	225 Lopes Road		Low Impact Alt B and C ESA	SCDRM Files LUST	The facility is a commercial business. Two USTs removed in August 1993. Confirmation soil samples contained low levels of contaminants. The tank pit was over-excavated and final confirmation soil samples contained no contamination.	This facility was granted a case closed status from the SCDRM in October 1995	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
11	Saturn of Fairfield	4850 Auto Plaza Court		Low Impact Alt B and C ESA	Recon	The property is an auto dealership with no reported releases that was not listed in the EDR report, on the GeoTracker website, or in SCDRM case files.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
12	Costco Gas Station	5101 Business Center Drive		Low Impact Alt B and C ESA	Recon EDR	The property is an active gas station with no reported releases located north of the project ESA and was listed in the EDR Report in the UST, RCRA SQG, and FINDS databases. The EDR Report identified three gasoline USTs in use at the facility. The facility was not listed in the GeoTracker database or in SCDRM case files.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
13	Green Valley Cleaners	5055 Business Center Drive		Low Impact Alt B and C ESA	Recon EDR	The property is an active dry cleaner with no reported releases located north of the project ESA. The business was listed in the EDR Report in the Drycleaners and HAZNET databases. Regulatory information for the facility was not listed on the GeoTracker website or available in SCDRM case files.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
14	Former Campbells Carpets	4731 Central Way		Low Impact Alt B and C ESA	SCDRM Files LUST	The property is a vacant portion of a commercial building. One UST removed in 1989 without SCDRM permit. In August 1997, SCDRM requested, soil and groundwater sampling to evaluate impacts. Soil and groundwater samples contained petroleum hydrocarbons and BTEX. Groundwater flow direction at that time was estimated to be to be toward the southeast. A 1998 soil gas survey indicated low risk to building occupants.	This facility was granted a case closed status from the SCDRM in September 1998.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
15	**Former Terminal Stations, Inc.**	**100 Suisun Valley Road**		**Moderate Impact Alt B and C ESA**	**SCDRM Files LUST**	**Currently vacant land, formerly occupied by a truck refueling facility located immediately west of I-80, north if the I-80/I-680 interchange. In 1984 a waste oil/diesel fuel discharge from the facility to an unnamed flood control channel was discovered adjacent and parallel to I-80. Impacted soil was excavated and surface water removed for offsite disposal. In 1987, USTs were operated at the property without a SCDRM permit A 1987 soil and groundwater investigation conducted along the perimeter of the facility included two soil boring locations within the Caltrans ROW adjacent to westbound I-80. Petroleum-impacted groundwater encountered in Caltrans ROW. In 1987, widespread onsite petroleum impacts to soil were identified. In 1988 all USTs were removed under SCDRM permit. In 1993, the groundwater flow direction was toward the south (toward the I-80/I-680 interchange).Subsequent groundwater extraction was conducted and monitoring indicated decreasing contaminant levels in groundwater.**	**Based on the decreasing contaminant concentration trends in groundwater, use of the property and lack of sensitive receptors within 1,000 feet, the SCDRM concluded that the facility met the requirements for low-risk case closure. The SCDRM granted UST case closure on May 3, 2001.**	**This facility presents a moderate risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries. Exploratory borings should be performed within the Caltrans ROW adjacent to the property to evaluate potential impacts to soil and groundwater, worker health & safety, and soil disposal options related to former petroleum hydrocarbon releases from UST operations and past surface water discharges at the adjacent property.**
16	Vacant land (former Arco Station)	4510 Central Way		Low Impact Alt B and C ESA	SCDRM Files LUST	Currently vacant land (formerly occupied by an Arco service station prior to 1987) located east of the project ESA. In 1993, soil and groundwater samples contained petroleum hydrocarbons. Groundwater flow direction in 1993 was toward the southeast.	The SCDRM granted UST case closure in July 2001.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
17	Chevron Station	4490 Central Way		Low Impact Alt B and C ESA	Recon SCDRM Files LUST	An active service station located east of the ESA. USTs removed in 1987. Onsite soil and groundwater impacts identified. Groundwater monitoring wells installed and sampled through 1997 showed decreasing contaminant levels. Groundwater flow direction in 1997 was toward the southeast. Subsequent onsite investigations during property transaction identified additional contamination that was remediated in 2001. Site conditions were also remediated following the UST removal and clean-up through 2003.	SCDRM granted low risk UST case closure for the prior USTs in 1997 and additional case closures in March 2001 and April 2004.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.

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I-80/I-680/SR-12 IMPROVEMENT PROJECT

Map ID No.	Facility	Address	APN	Impact to ROW and Acquisitions	Information Source(s)	Environmental Impacts/ Chemical of Concern	Regulatory Status	Potential Impact to I-80/I-680/SR-12 Improvement Project and Recommendations
18	Shell Station	4450 Central Way		Low Impact Alt B and C ESA	Recon SCDRM Files LUST	Active service station located east of the project ESA. USTs removed 1986. Onsite impacts to soil and groundwater identified. Groundwater monitoring wells were installed and monitored. Soil excavation and groundwater over-pumping conducted. Groundwater flow direction in 1996 was toward the southwest. Final groundwater sampling reported no further impacts.	SCDRM granted UST case closure in April 1996.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries
18	**76 Station**	**134 Pittman Road**		**Moderate Impact Alt B and C ESA**	**Recon SCDRM Files LUST**	**Active service station with located at the northeast corner of the Pittman Road/Suisun Valley Road entrance ramp to eastbound I-80. USTs removed in 1993 and impacted onsite soil and groundwater over-excavated and over-pumped for offsite disposal. Groundwater wells installed and monitored through 2001. Groundwater impacts indicated decreasing trends. Groundwater flow direction in 2001 was toward the west-southwest. Impacted groundwater has approached the property boundary at Pittman Road, south of the eastbound I-80 entrance ramp.**	**SCDRM granted low risk UST case closure on July 27, 2001.**	**This facility presents a moderate risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries. Exploratory borings should be performed in the Caltrans ROW at the Pittman Road/I-80 area prior to construction to evaluate soil and groundwater conditions, worker health & safety, and soil disposal groundwater treatment options due to potential impacts from petroleum hydrocarbon releases at the adjacent property.**
20	Valero Station	4444 Central Place		Low Impact Alt B and C ESA	Recon UST SCDRM Files	An active service station located east of the project ESA. Gasoline and diesel UST were installed at the facility in 2001 when the station was built. No violations or unauthorized releases were noted in the SCDRM files.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
21	Arco Station	4449 Central Place		Low Impact Alt B and C ESA	Recon SCDRM Files LUST	An active service station located east of the project ESA. USTs upgraded at the facility in 1998. Petroleum impacted soil identified at that time was excavated and removed. SCDRM requested additional soil and groundwater sampling to further define impacted areas. In 1999, additional soil and groundwater samples indicated low petroleum impacts.	SCDRM granted UST case closure on June 11, 1999.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
22	Scandia Family Center	4300 Central Place		Low Impact Alt B and C ESA	Recon EDR	The facility is a miniature golf and arcade entertainment park located south of the project ESA. The EDR report listed a UST closed at the property on January 25, 2005. The facility was listed on the GeoTracker website as a registered UST facility, though not as a release site.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
23	**Former Old Fruit Bowl Mobil Station (Valine Ranch Property)**	**4000 Russell Road**		**Moderate Impact Alt B and C ESA**	**SCDRM Files LUST**	**The property is a former service station (operated from 1946 to 1972) located west of and adjacent to I-80 within the project ESA on land proposed for Caltrans acquisition. Five USTs removed in 2000 under observation by SCDRM. Onsite petroleum impacts to soil and groundwater identified. Impacted soil over-excavated for onsite remediation and groundwater over-pumped for offsite disposal. Residual petroleum impacted soil and groundwater remain onsite.**	**SCDRM granted case closure on June 11, 2008.**	**This facility presents a moderate risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries. Exploratory borings should be performed if partial or full parcel take is contemplated to evaluate soil and groundwater conditions, worker health & safety, and soil disposal and groundwater treatment options due to impacts from residual petroleum hydrocarbon releases at the property.**
24	Pacific Gas & Electric substation	South of the I-80/SR-12 East interchange		Low Impact Alt B and C and Options 1 and 2 ESA	Recon	Active PG&E electrical substation with fluid-cooled pad-mounted transformers. Possible polychlorinated biphenyl (PCB) compound impacts to soil at the facility.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
25	**Moore Tractor Company**	**4088 Russell Road**	**0027-510-040**	**Moderate Impact Alt B and C ESA**	Recon Prior Phase I SCDRM Files	Currently a tractor sales and service facility located southwest of the I-80/SR-12 East interchange and within the project ESA on land proposed for Caltrans acquisition. SCDRM inspections reported bulk automotive fluids stored at the property including diesel fuel (500-gallon AST), engine oil, and waste oil. A cement sump associated with a wash rack was also noted. Past SCDRM violations have included an overflowing sump, onsite automotive fluid spills, and improper drum storage.	No pending regulatory action or active violations are noted for this facility.	This facility presents a moderate risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries. Exploratory borings should be performed if partial or full parcel take is contemplated to evaluate potential impacts to soil and groundwater, worker health & safety, and soil disposal and groundwater treatment options related to past use of petroleum hydrocarbons and past operations at the property.
26	**Concrete Pipe Distributors**	**4974 Abernathy Road**	**0027-510-070**	**Moderate Impact Alt B and C ESA**	Recon Prior Phase I	Currently a concrete pipe distributor located southwest of the I-80/SR-12 East interchange. A prior UST was reportedly removed in approximately 1985. No SCDRM information regarding the removal. 55-gallon drums from the adjacent Moore Tractor Co. were observed stored at the facility in 1994.	No pending regulatory action or active violations are noted for this facility.	This facility presents a moderate risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries. Exploratory borings should be performed if partial or full parcel take is contemplated to evaluate potential impacts to soil and groundwater, worker health & safety, and soil disposal and groundwater treatment options related to former UST operation and past conditions noted at the property.
27	Ford of Fairfield	3050 Auto Mall Court		Low Impact Alt B and C and Options 1 and 2 ESA	Recon	Active automobile dealership with no reported releases.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.

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I-80/I-680/SR-12 IMPROVEMENT PROJECT

Map ID No.	Facility	Address	APN	Impact to ROW and Acquisitions	Information Source(s)	Environmental Impacts/ Chemical of Concern	Regulatory Status	Potential Impact to I-80/I-680/SR-12 Improvement Project and Recommendations
28	Chrysler dealer	2955 Auto Mall Parkway		Low Impact Alt B and C and Options 1 and 2 ESA	Recon	Active automobile dealership with no reported releases.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
29	Dodge dealer	2901 Auto Mall Parkway		Low Impact Alt B and C and Options 1 and 2 ESA	Recon	Active automobile dealership with no reported releases.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
30	Volvo dealer	2855 Auto Mall Parkway		Low Impact Alt B and C and Options 1 and 2 ESA	Recon	Active automobile dealership with no reported releases.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
31	Hyundai dealer	2775 Auto Mall Parkway		Low Impact Alt B and C and Options 1 and 2 ESA	Recon	Active automobile dealership with no reported releases.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
32	Toyota dealer	2595 Auto Mall Parkway		Low Impact Alt B and C and Options 1 and 2 ESA	Recon	Active automobile dealership with no reported releases.	No pending regulatory action or active violations are noted for this facility.	This facility presents a low risk of impacting the I-80/I-680/SR-12 West Alternatives B and C based on proposed construction area boundaries.
33	Canova Moving and Storage	1336 Woolner Avenue		Low Impact Options 1 and 2 ESA	LUST Geotracker	Currently an active moving and storage company located northwest of the project ESA. One UST removed in 1989 and petroleum-impacted soil and groundwater identified. Groundwater wells installed and impacted groundwater monitored. Groundwater concentrations decreased during the 1990s. Additional investigations have defined onsite areas on soil and groundwater impacts. Groundwater flows to the southeast, though impacted groundwater does not extend south beyond Woolner Avenue.	On-going groundwater monitoring required by SCDRM.	This facility presents a low risk of impacting the SR-12 East Options 1 and 2 based on proposed construction area boundaries.
34	Suisun Fire District	445 Jackson Street		Low Impact Options 1 and 2 ESA	LUST SCDRM Files	An active district fire station located north of the project ESA. One UST removed in 1992. The tank pit was over-excavated and soil samples contained low petroleum impacts. Onsite groundwater wells were installed and monitored. Final sampling showed no petroleum impacts to groundwater.	SCDRM granted UST case closure on July 18, 1997.	This facility presents a low risk of impacting the SR-12 East Options 1 and 2 based on proposed construction area boundaries.
35	**Former Sheldon Oil Co.**	**426 Main Street**		**Moderate Impact Option 1 ESA**	**LUST Sanborn Maps SCDRM Files**	**A former bulk petroleum storage facility located at the north end of the Suisun Channel, northeast of a portion of the project ESA (Option 1 SR-12 East Concept). The property has been redeveloped to support a commercial office building (One Harbor Plaza), associated parking lot, and harbor waterfront walkways. The former Sheldon Oil Company was depicted in 1945 and 1954 Sanborn Maps. The facility stored bulk quantities of diesel fuel No. 2, asphalt emulsion, heating fuel Nos. 4, 5, 6, and used motor oil. Onsite soil impacted by petroleum hydrocarbons to a minimum depth of 9 ft. Onsite groundwater also impacted. Impacted areas extend to the Suisun Channel. Additional information regarding investigations and clean-up at the property were not available in SCDRM files.**	**SCDRM granted case closure to the facility on October 18, 1995.**	**This facility presents a moderate risk of impacting the SR-12 East Option 1 based on proposed construction area boundaries. Exploratory borings should be performed prior to roadway construction in areas near Main Street in Suisun City to evaluate potential impacts to soil and groundwater, worker health & safety, and soil disposal and groundwater treatment options related to residual impacts related to former UST operations and other onsite chemical handling operations at the adjacent property.**
36	**Former Sheldon Oil Co.**	**526 School Street**		**Moderate Impact Option 1 ESA**	**LUST SCDRM Files**	**Currently a vacant lot (formerly used by the Sheldon Oil Co. as a truck washing/cleaning facility from the mid-1940s to 1993) located west of the Suisun Channel, at or adjacent to a portion of the project ESA (Option 1 SR-12 East Concept). Operations as the facility included the use of trichloroethylene (TCE) to clean truck tanks. Onsite TCE discharges reported and onsite soil and onsite/offsite groundwater impacted by petroleum hydrocarbons and VOCs identified. VOC-impacted groundwater has migrated offsite to the northeast. Impacted soil excavated and groundwater over-pumped for offsite disposal in 2006. Groundwater monitoring on-going.**	**On-going groundwater monitoring required by SCDRM.**	**This facility presents a moderate risk of impacting the SR-12 East Option 1 based on proposed construction area boundaries. Exploratory borings should be performed if partial or full parcel take is contemplated or if road construction is planned near the property to evaluate potential impacts to soil and groundwater, worker health & safety, and soil disposal and groundwater treatment options related to former onsite chemical handling operations.**

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I-80/I-680/SR-12 IMPROVEMENT PROJECT

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37	Former Texaco Station	522 Main Street		Low Impact Option 1 ESA	LUST SCDRM Files	Currently a municipal parking lot (formerly occupied by a service station) located east of the project ESA (Option 1 SR-12 East Concept). USTs removed prior to 1991. Petroleum-impacted soil and groundwater identified and impacted soil excavated for offsite disposal. Following excavation, soil and groundwater impacts had decreased.	SCDRM granted closure UST case closure on April 14, 1997.	This facility presents a low risk of impacting the SR-12 East Option 1 based on proposed construction area boundaries.
38	Union Pacific Railroad/705 West Street	705 West Street		Low Impact Option 1 ESA	LUST SCDRM Files	Currently a commercial facility located southeast of the project ESA (Option 1 SR-12 East Concept). Two USTs removed in 1998. Soil and groundwater petroleum impacts identified. Shallow groundwater at the property was designated as brackish and tidally influenced and not of domestic beneficial use. Due to these conditions, additional groundwater monitoring was not required.	SCDRM granted UST case closure on July 15, 1999.	This facility presents a low risk of impacting the SR-12 East Option 1 based on proposed construction area boundaries.
NA	**I-80/I-680/SR-12 West and East Bridge Structures**	**Various Locations**	**NA**	**Existing I-80/I-680/ SR-12 West and East ROW**	**Recon**	**Existing bridge structures to be renovated, or removed.**	**NA**	**Asbestos and lead-containing paint surveys should be conducted at the bridge structures prior to any planned renovation or demolition to evaluate worker health & safety, abatement and waste disposal options and comply with applicable regulations, including Bay Area Air Quality Management District requirements.**
NA	**I-80/I-680/SR-12 West and East**	**ROW Acquisition**	**NA**	**New ROW**	**Recon**	**Properties with current or historical agricultural land use may contain residual agricultural chemicals in shallow soil.**	**NA**	**Conduct soil investigations for pesticides, herbicides, and metals as applicable on land proposed for full or partial acquisition based on past agricultural land usage to evaluate soil reuse or disposal options.**
NA	**I-80/I-680/SR-12 West and East**	**ROW Acquisition**	**NA**	**New ROW**	**Recon**	**Existing structures within the project ESA and on parcel takes requiring demolition.**	**NA**	**Asbestos and lead-containing paint surveys should be conducted prior to any planned renovation or demolition of buildings either within the Caltrans ROW or on properties proposed for full or partial takes to evaluate worker health & safety, abatement and waste disposal options and comply with applicable regulations, including Bay Area Air Quality Management District requirements.**
NA	**I-80/I-680/SR-12 West and East**	**Union Pacific Railroad Bridge and Crossing**	**NA**	**Existing I-80/I-680/ SR-12 West and East ROW**	**Recon**	**Planned excavation and grading within existing ROW and potential railroad crossing in SR-12 East Option 1. Potential metals, herbicides, petroleum hydrocarbons, and PAHs resulting from past railroad operations.**	**NA**	**Perform soil and groundwater sampling for metals, herbicides, petroleum hydrocarbons, and PAHs as applicable based on proposed construction practices at UPRR Bridge (near I-80/SR-12 West interchange and potential UPRR track crossing in Suisun City to evaluate potential impacts to soil and groundwater, worker health & safety, and soil disposal and groundwater treatment options related to past railroad operations.**
NA	**I-80/I-680/SR-12 West and East**	**Existing Corridors**	**NA**	**Existing I-80/I-680/ SR-12 West and East ROW**	**Recon Prior Nearby ADL Study**	**Planned excavation and grading within existing ROW**	**NA**	**Perform shallow soil sampling to evaluate potential ADL in soil for worker health & safety and soil disposal options related to historical automobile exhaust emissions.**
NA	**I-80/I-680/SR-12 West and East**	**Existing Corridors**	**NA**	**Existing I-80/I-680/ SR-12 West and East ROW**	**Recon**	**Planned excavation and pavement work within existing ROW**	**NA**	**Further evaluate potential hazardous waste issues or provide construction special provisions for thermoplastic traffic paint, asbestos pipe, bridge rail post sulfur and proper abandonment of wells, septic systems, and encountered unidentified USTs.**

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Properties and locations listed in **BOLD** print have a moderate risk of impacting the project ESA and are recommended for further evaluation.

Notes: ESA – Environmental Study Area
UST – Underground Storage Tank
AST – Aboveground Storage Tank
UPRR– Union Pacific Rail Road
BTEX – Benzene, Toluene, Ethylbenzene, and Total Xylenes
NA – Not Applicable
EDR – Environmental Data Resources database
SFBRWQCB – San Francisco Bay Regional Water Quality Control Board
LUST – Leaking UST
PAHs – Polynuclear Aromatic Hydrocarbons
SCDRM – Solano County Department of Resource Management
ROW – Right-of-way
ADL – Aerially Deposited Lead
TPHg – Total Petroleum Hydrocarbons as Gasoline
TPHd – Total Petroleum Hydrocarbons as Diesel

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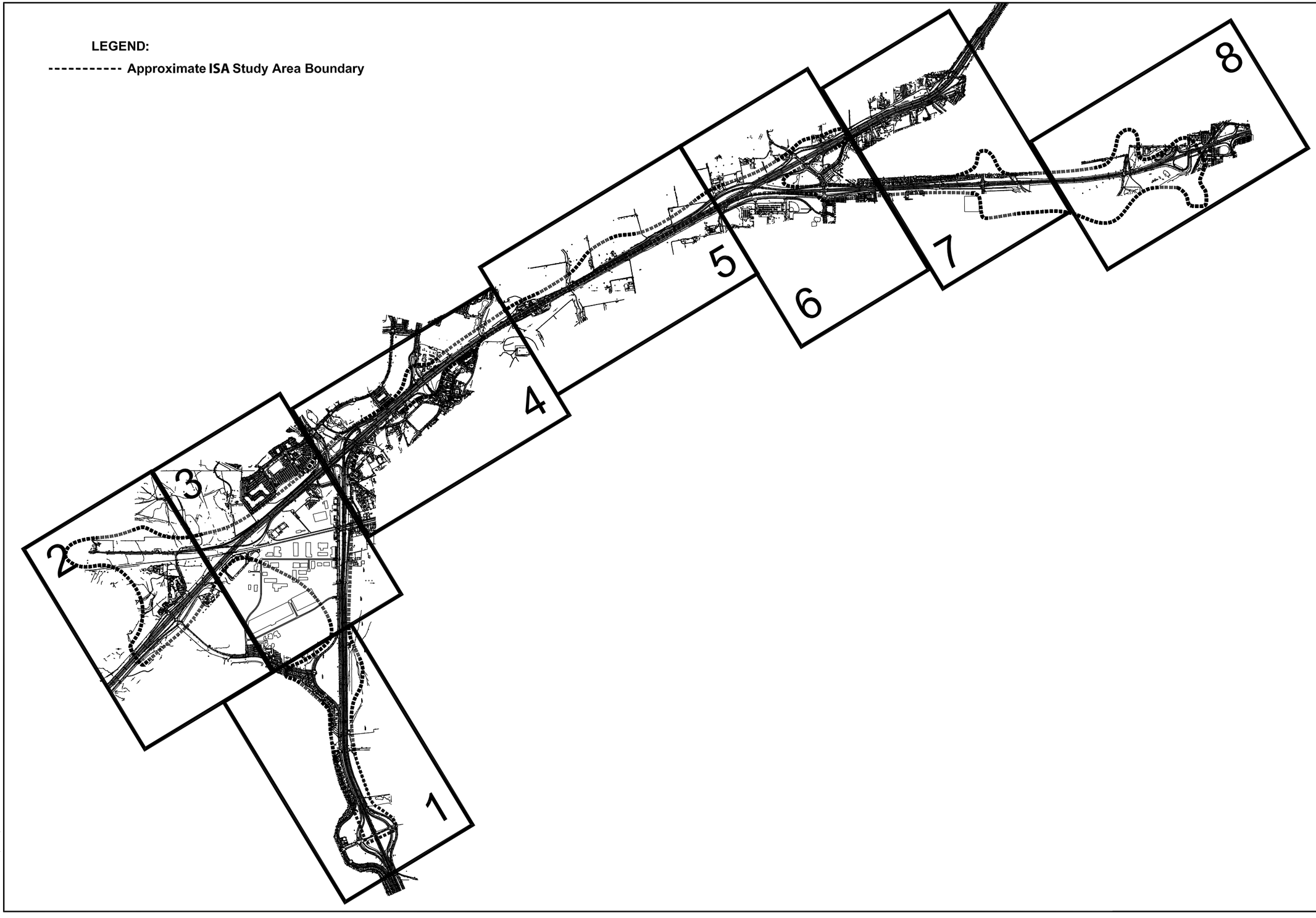
LEGEND:

---------- Approximate ISA Study Area Boundary



02166.02 Haz Mat (10-09)

Figure 3.2.5-1
Potential Hazardous Facility Locations

02166.02 Haz Mat (10-09)

Figure 3.2.5-2
Potential Hazardous Facility Locations

02166.02 Haz Mat (10-09)

Figure 3.2.5-3
Potential Hazardous Facility Locations

LEGEND:

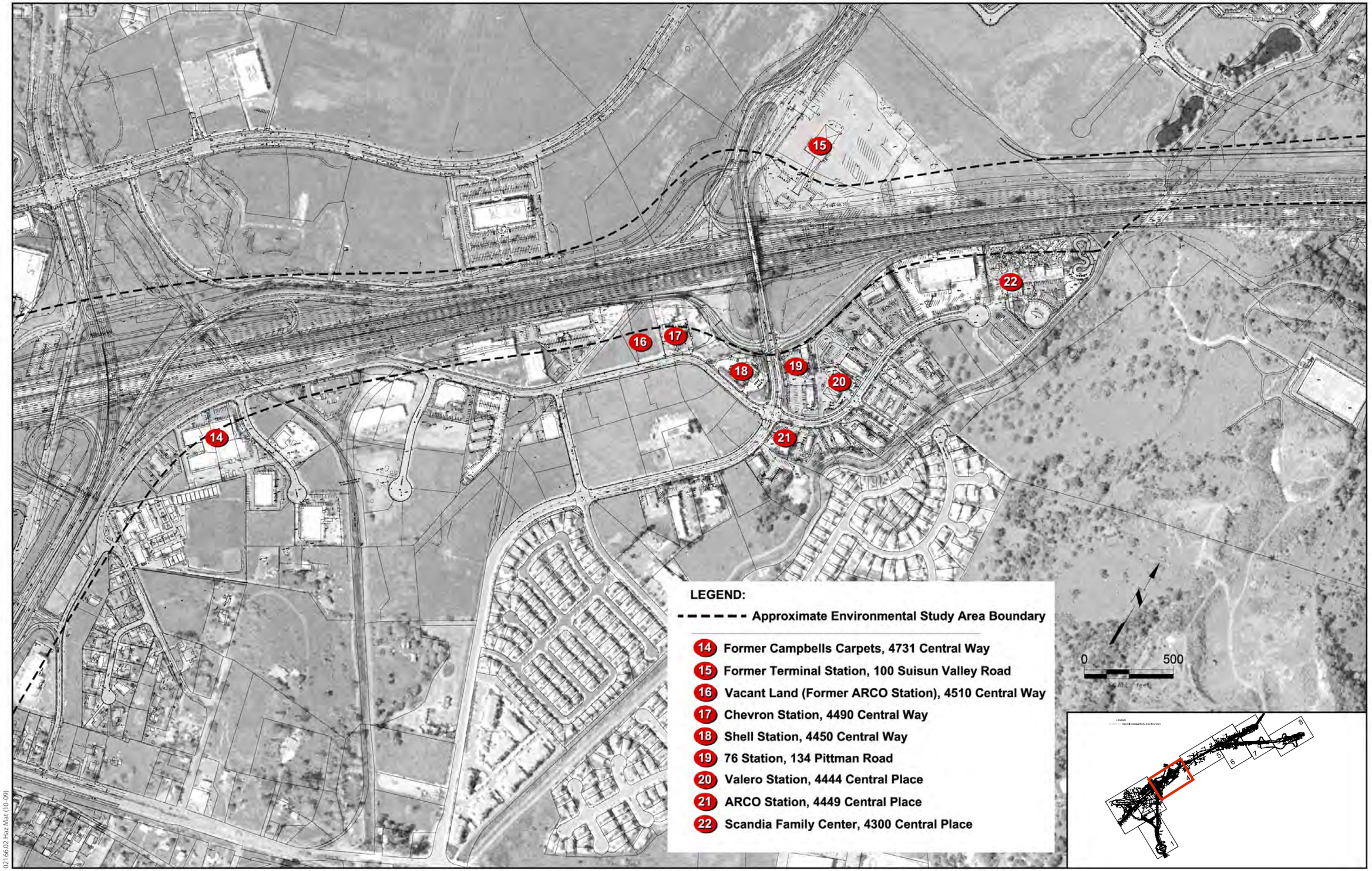
- Approximate Environmental Study Area Boundary

5. UPS, 5000 W. Cordelia Road
6. PrimeSource, 250 Dittmer Road
7. ARCO Station, 105 Lopes Road
8. Napa Valley Beverage Co., 497 Edison Court
9. Hudson Beverage Co., 237 Lopes Road
10. Sierra Truck & Van, 225 Lopes Road (Former Trail Wagons)
11. Saturn of Fairfield, 4850 Auto Plaza Court
12. Costco Gas Station, 5101 Business Center Drive
13. Green Valley Cleaners, 5055 Business Center Dr.

0 500
SCALE: feet

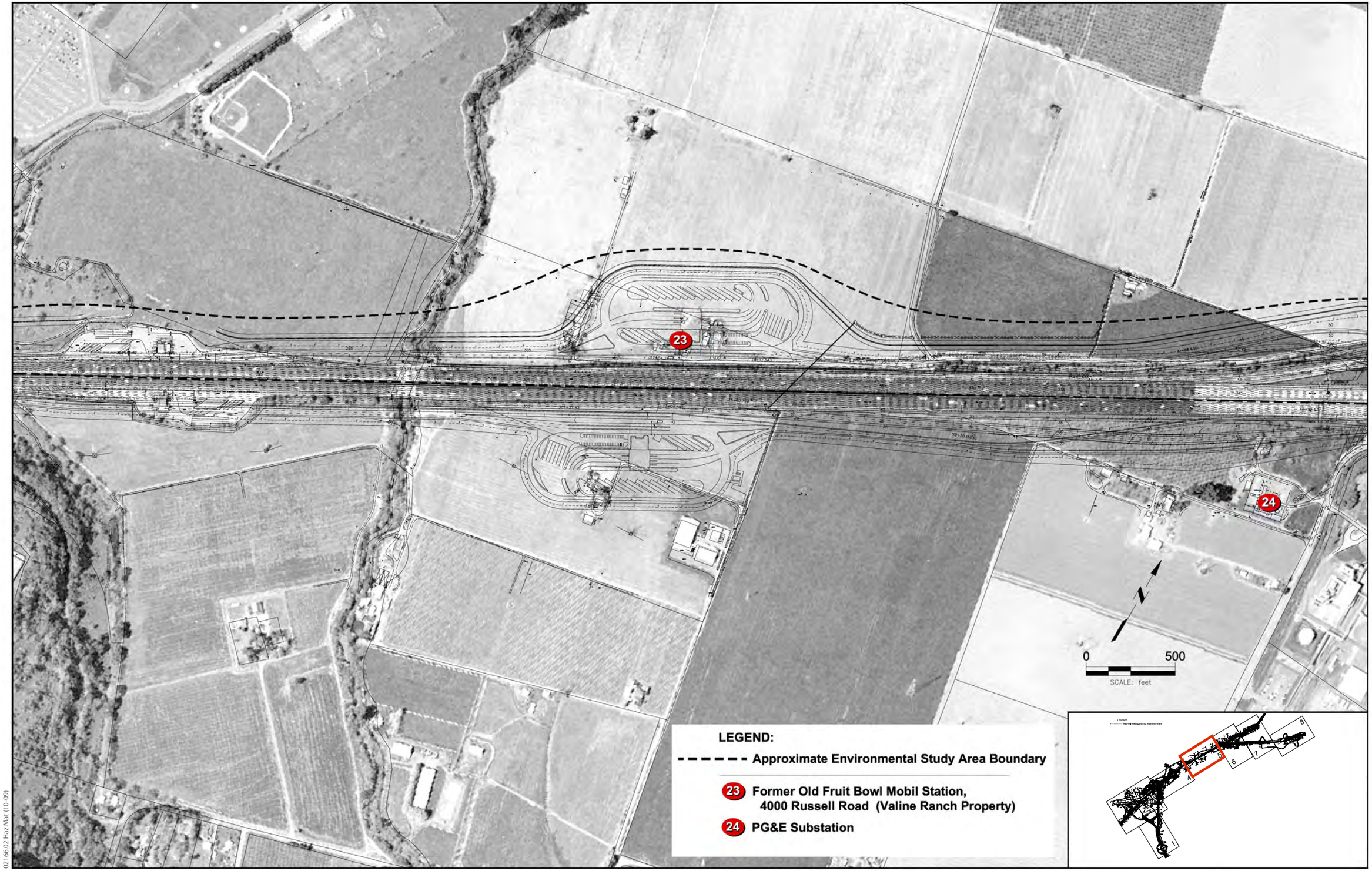
02166.02 Haz Mat (10-09)

Figure 3.2.5-4
Potential Hazardous Facility Locations



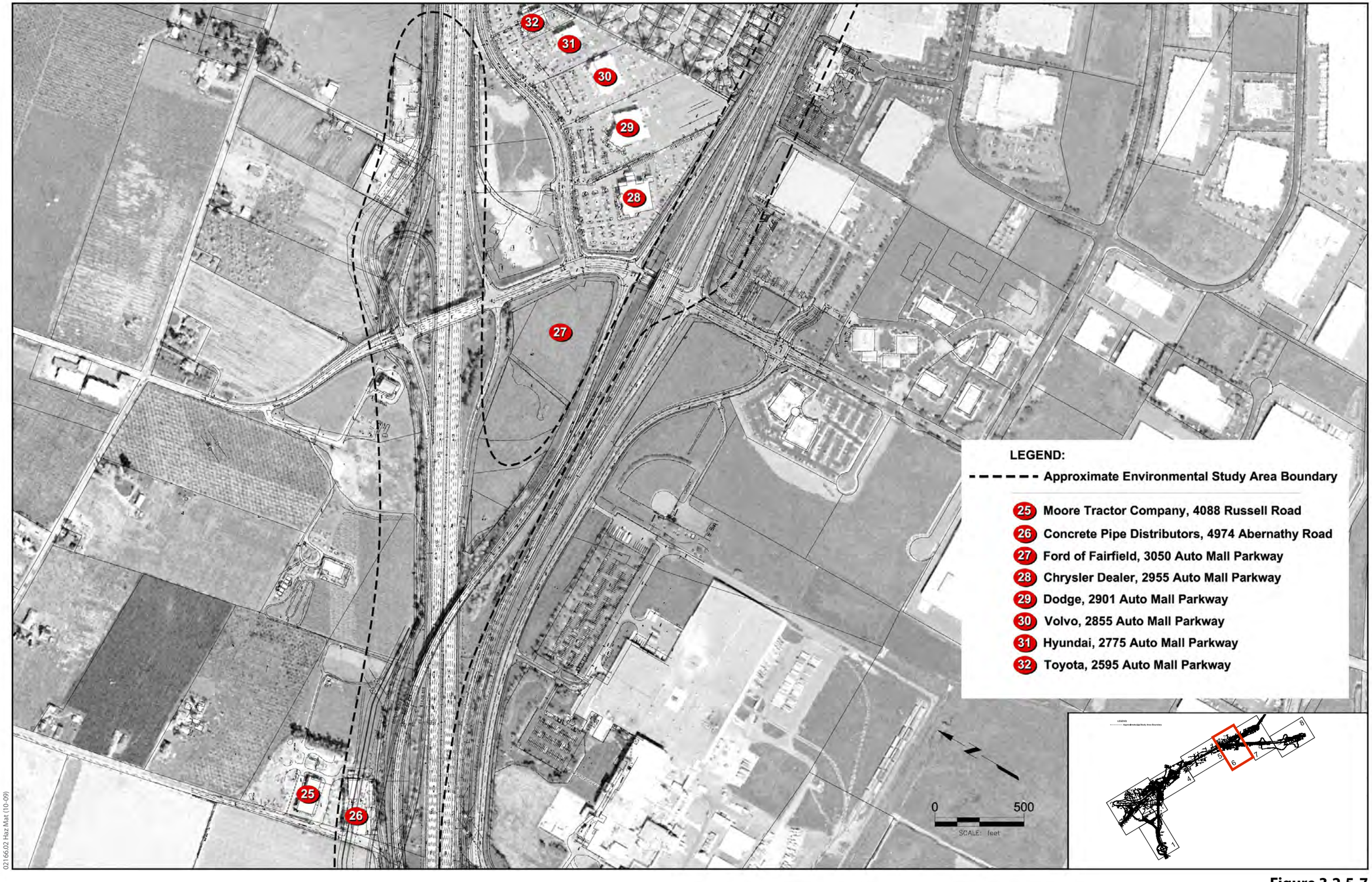
02166.02 Haz Mat (10-09)

Figure 3.2.5-5
Potential Hazardous Facility Locations



02166.02 Haz Mat (10-09)

Figure 3.2.5-6
Potential Hazardous Facility Locations



02166.02 Haz Mat (10-09)

Figure 3.2.5-7
Potential Hazardous Facility Locations

LEGEND:

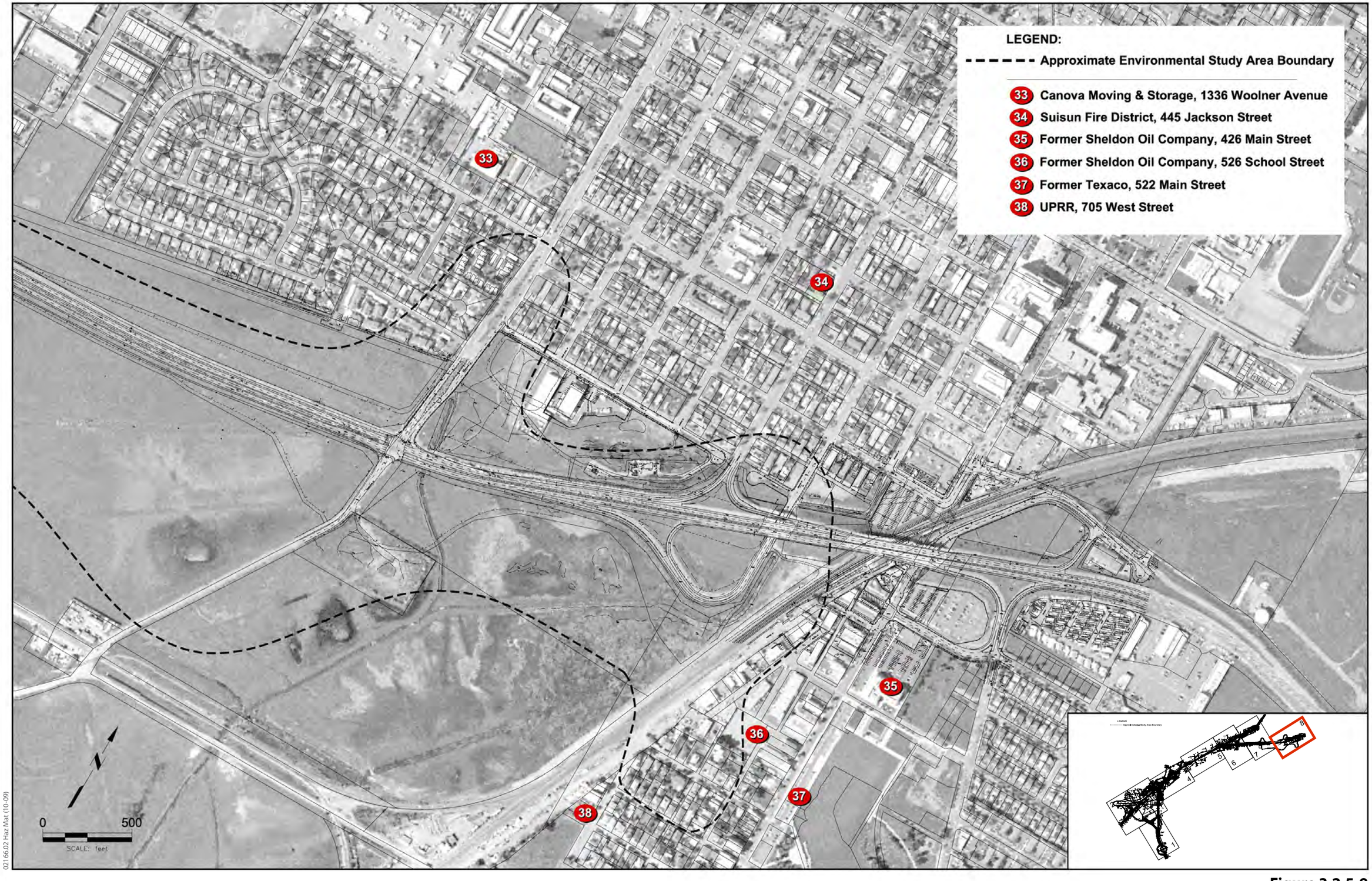
Approximate Environmental Study Area Boundary

0 500

SCALE: feet

02166.02 Haz Mat (10-09)

Figure 3.2.5-8
Potential Hazardous Facility Locations



02166.02 Haz Mat (10-09)

Figure 3.2.5-9
Potential Hazardous Facility Locations