Chapter 2 Affected Environment, Environmental Consequences, and Mitigation Measures

This chapter addresses the environmental impacts of the proposed project as well as identified avoidance and mitigation measures that will be carried out as part of the project. Cumulative impacts for all affected resources are discussed in Section 2.21. Maps of the project design are included in Appendix A. An evaluation of the project consistent with CEQA checklist criteria is provided in Appendix B. Mitigation measures are discussed for each of the discipline areas covered in the following subsections and are also summarized in Appendix C.

As part of the scoping and environmental analysis conducted for the project, paleontology was considered but no adverse impacts were identified. Consequently, there is no further discussion regarding paleontology in this document.

All five phases were evaluated as the proposed project in the following sections. Impacts of each phase are detailed where appropriate.

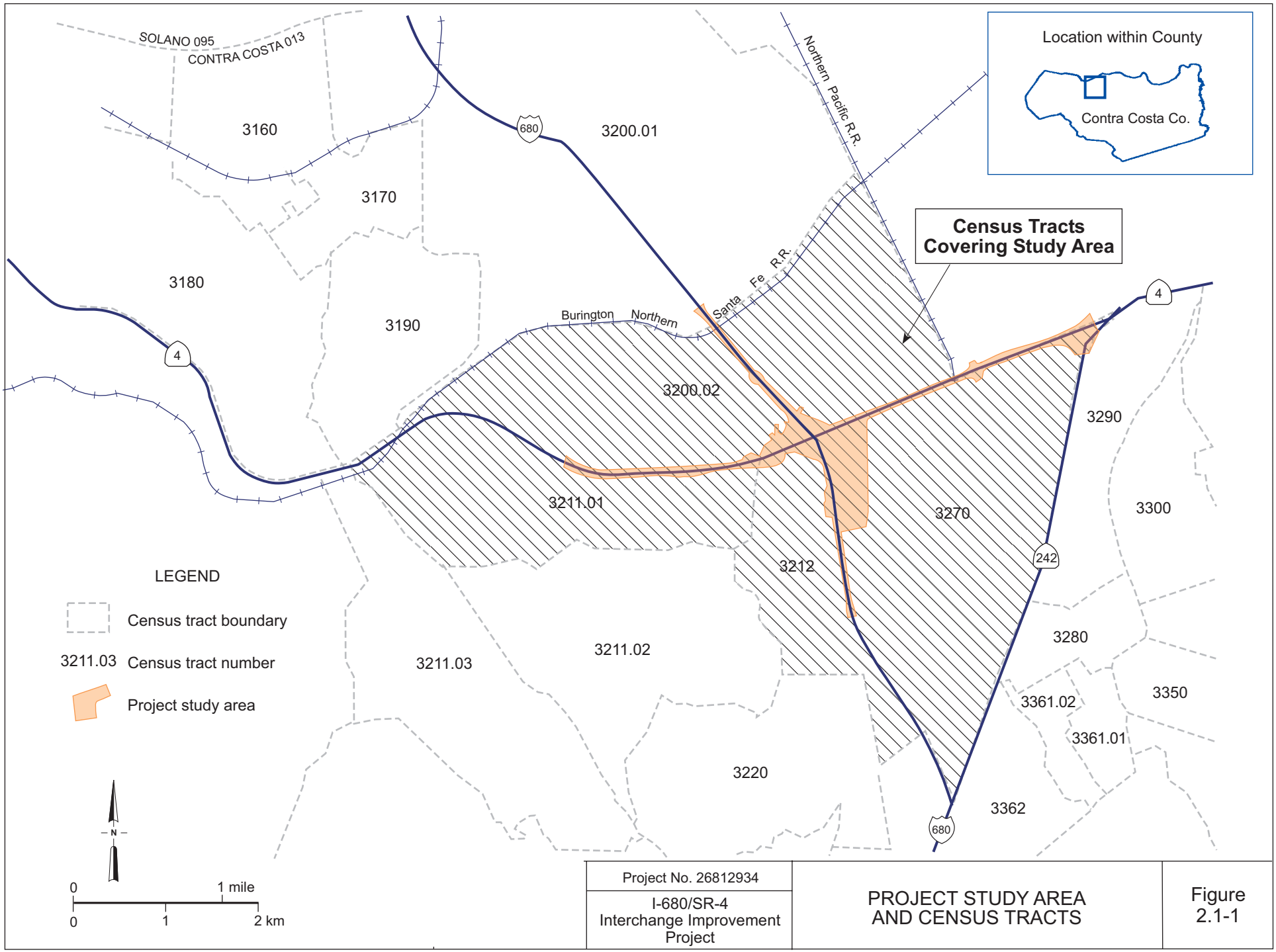
2.1 Land Use, Planning, and Growth

This section provides a discussion of the existing land uses, General Plan land use designations, and urban policies related to Contra Costa County, the City of Martinez, and the study area. This section also addresses growth and the potential for growth inducement.

2.1.1 Affected Environment

2.1.1.1 Current Land Use

Contra Costa County's land use ranges from urban to rural. In the west and central county areas, including the study area, primary uses of suburban cities and towns are residential, commercial, and industrial. In the east central county and east county area, land is used primarily for agriculture and general open space.



Project No. 26812934 I-680/SR-4 Interchange Improvement Project	PROJECT STUDY AREA AND CENSUS TRACTS	Figure 2.1-1

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The proposed project falls largely within the unincorporated areas of Pacheco and Vine Hill. A small portion of eastern Martinez is included in the study area. The study area is defined as the right-of-way, while the overlying Census Tracts (CTs) were used to gather available data to represent the project's study area and adjacent land uses and communities. Residential areas fall within each of the study area's CTs, with some small neighborhoods located along the major roads. Figure 2.1-1 is a regional map of the project study area and overlying census tracts.

2.1.1.2 Land Use Planning

The proposed project would cross the jurisdictional boundaries of the City of Martinez and Contra Costa County. The alignment of SR-4 east of I-680 is in county lands and west of I-680 is either city lands or within the city sphere's of interest and influence (Martinez 1995; Contra Costa County 1996). The land use designations of the city and county are shown on Figure 2.1-2.

City of Martinez

The Martinez General Plan designates residential and commercial land uses within the study area west of I-680. With the exception of a small residential area and the Central Contra Costa Sanitary District Sewage Treatment Plant, the area east of I-680 and north of SR-4 is designated as open space.

Contra Costa County

Since 1990, Contra Costa County has had the 65/35 Contra Costa County Land Preservation Plan in place (also referred to as Measure C). This measure requires, among other things, that no less than 65 percent of the land in the county be preserved for parks, open space, agriculture, wetlands, and other nonurban uses. According to the Contra Costa County's Community Development office and based on data from the California Department of Conservation, as of 2000, between 28 percent and 30 percent of the county's land had an urban land use or was planned for urban use. The remaining 70 percent of the county lands had nonurban land uses and were planned for nonurban uses.

Most of the land in the immediate vicinity of the proposed project is designated as public or semipublic land. Within the project's proposed right-of-way, some land is also designated for commercial or light industrial use.

2.1.1.3 Growth

Regulatory Setting

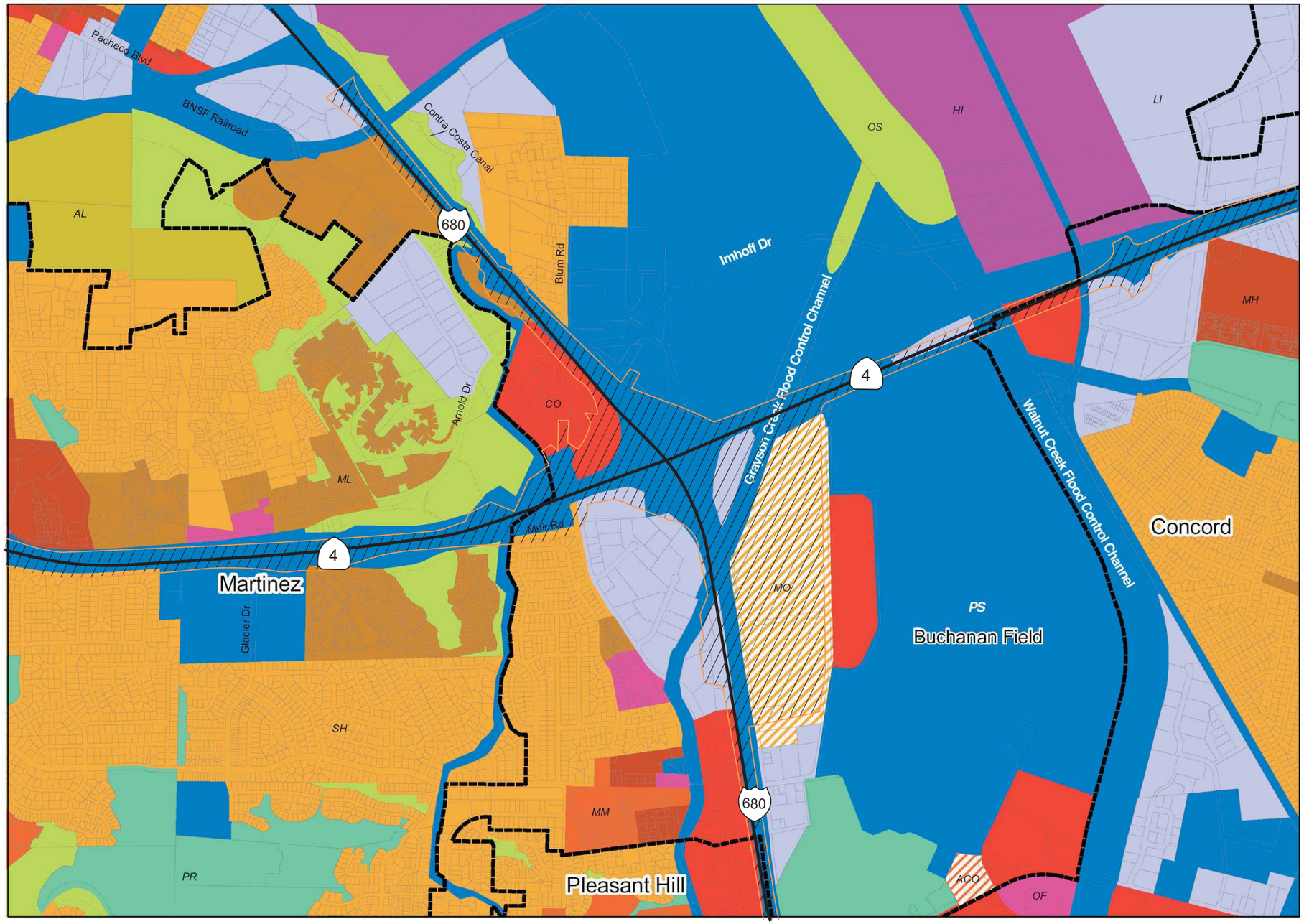
The Council on Environmental Quality (CEQ) regulations, which implement the National Environmental Policy Act of 1969, require evaluation of the potential environmental consequences of all proposed federal activities and programs. This provision includes a requirement to examine indirect consequences, which may occur in areas beyond the immediate influence of a proposed action and at some time in the future. The CEQ regulations, 40 CFR 1508.8, refer to these consequences as secondary impacts. Secondary impacts may include changes in land use, economic vitality, and population density, which are all elements of growth.

The California Environmental Quality Act (CEQA) also requires the analysis of a project's potential to induce growth. CEQA guidelines, Section 15126.2(d), require that environmental documents "…discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment…"

Existing and Planned Growth

The Contra Costa County 1995–2010 General Plan lays out the county's growth management policies that are intended to optimize land use and control urban sprawl (Contra Costa County 1996). One such policy is the 65/35 Land Preservation Plan described above. The Plan operates on a countywide basis and includes urban and nonurban land uses within cities as well as unincorporated areas (Contra Costa County 1996: 3-17).

In 2000, in order to address the region's mounting traffic congestion, housing affordability crisis, and shrinking open space, the intra-regional Bay Area Smart Growth Strategy and Regional Livability Footprint Project was initiated. The project incorporates public participation into its long-term planning process through numerous public workshops that lead to "Smart Growth Visions" on a county-by-county basis. Because much of the study area is in unincorporated areas of the county, it falls under the county plan and thus, the Smart Growth strategy. In Contra Costa County, the Smart Growth strategy works in tandem with the local "Shaping Our Future" program. Launched by all 19 Contra Costa County cities, Shaping Our Future is a local growth management program that incorporates land use planning and other growth-related needs. For example, the county has an established urban limit line beyond which urban densities are not allowed. The urban limit line also facilitates the enforcement of the 65/35 Land Preservation Plan.



LEGEND

- SV (Single Family Residential - Very Low)
- SL (Single Family Residential - Low)
- SM (Single Family Residential - Medium)
- SH (Single Family Residential - High)
- ML (Multiple Family Residential - Low)
- MM (Multiple Family Residential - Medium)
- MH (Multiple Family Residential - High)
- MV (Multiple Family Residential - Very High)
- MS (Multiple Family Residential - Very High Special)
- CC (Congregate Care/Senior Housing)
- MO (Mobile Home)
- CO (Commercial)
- OF (Office)
- BP (Business Park)
- LI (Light Industry)
- HI (Heavy Industry)
- AL, OIBA (Agricultural Lands & Off Island Bonus Area)
- CR (Commercial Recreation)
- ACO (Airport Commercial)
- LF (Landfill)
- MU (Mixed Use)
- PS (Public/Semi-Public)
- PR (Parks and Recreation)
- OS (Open Space)
- AL (Agricultural Lands)
- AC (Agricultural Core)
- DR (Delta Recreation)
- WA (Water)
- WS (Watershed)

Study Area

N

0 1000 2000

feet

Project No. 26812934 I-680/SR-4 Interchange Improvement Project	STUDY AREA LAND USE MAP	Figure 2.1-2

For Contra Costa County, the major growth centers are the cities of Clayton, Antioch, Danville, and San Ramon, each of which recorded population growth of over 25 percent between 1990 and 2000, according to 2000 Census data.

According to the Contra Costa County Community Development Department, no approved, proposed, or planned developments currently exist within the study area (Roche 2002).

Development Trends

Within Contra Costa County, approximately 37,109 hectares (ha) (91,701 acres) of land is either approved or proposed for development. However, none of it is located within the study area. The nearest developable land is located just outside the northwest portion of the study area.

The county's population, housing, and employment are also expected to increase as the project's design year 2030 approaches. ABAG predicts that between 2000 and 2025, the county population will have grown approximately 27.5 percent while county jobs will have increased by 37.2 percent (see Table 2.1-1; the census tracts listed in that table are shown in Figure 2.1-1). By comparison, during the same period, the population in the study area will have grown by 11.1 percent. Jobs in the study area are projected to grow from 23,525 in 2000 to 29,304 in 2025, an increase of 25 percent. These forecasts show strong projected job growth, which may add pressure for commercial and industrial sector growth in the study area.

Table 2.1-1 Study Area Populations

Attribute	Contra Costa County	CT 3200.02	CT 3211.02	CT 3212	CT 3270
Total Population (1990)	803,732	6,256	6,769	4,716	6,475
Total Population (2000)	948,816	8,225	6,526	5,249	6,963
Percent Change 1990-2000	*+18%*	*+31%*	*-3.6%*	*+11%*	*+7.5%*
Total Population (2025, estimated)	1,209,900	9,225	6,934	6,374	7,435
Percent Change 2000-2025	*+27.5%*	*+12.2%*	*+6.3%*	*+21.4%*	*+6.8%*

Source: U.S. Census 1990 and 2000, ABAG population projections

2.1.2 Permanent and Construction Impacts

2.1.2.1 Land Use Changes

Some of the proposed project phases would result in direct land use changes, such as the conversion of residential and commercial lands to State right-of-way. Limited loss of property may take place within the existing parking areas for up to two area businesses and the CHP, but business operations would not be affected. Public parking would be maintained throughout the project vicinity. Areas of a Caltrans Park and Ride lot may also be affected by project construction, but steps would be taken during the project construction phases to ensure that there is no net loss of parking.

Indirect land use changes could also occur within the study area because of the proposed project. However, these are limited by the physical constraints within the vicinity of the existing interchange. Development that occurs adjacent to the proposed project would still be in the areas covered under the City and County General Plans and thus not considered growth inducement, as discussed below.

2.1.2.2 Consistency with Land Use Plans

The plans to improve the I-680/SR-4 interchange are consistent with the County General Plan and regional Bay Area plans, and the land use designations set forth in the County General Plan do not conflict with the proposed land uses for the project. Moreover, the Transportation Element of the Contra Costa County General Plan indicates that Contra Costa households generate more trips than the average Bay Area household (9.8 trips per day versus 8.7 trips per day), and that county households are more likely to use a car for their trips than other Bay Area households (8.1 in-vehicle trips per day versus 6.8 in-vehicle trips per day). On an average weekday, the General Plan states, Contra Costa residents make almost one million trips, with 120,000 trips for commuters working outside the county. The congestion generated by these traffic patterns requires a more efficient transportation network. As I-680 and SR-4 are major arterial roadways for the county, improvements to this roadway system are in keeping with the goals and plans set forth in the County General Plan.

2.1.2.3 Growth and the Potential for Growth Inducement

Growth, as used in this report, refers to the development of the built environment as communities respond to the demands of an increasing population and/or business environment. Growth trends fluctuate over periods of low and high activity depending on factors such as policy, zoning, economy, and infrastructure that either encourage or discourage it. The nature of a development project can be described as

tending toward growth inducement or growth accommodation; the former being a project that creates potential for further development where it is not planned for, and the latter being a project that is planned as a response to existing or foreseeable demands of the community served. This distinction generally explains the intent and purpose of a proposed project.

This discussion of growth addresses the compatibility of the proposed project with the planning documents that direct development activities (i.e., the County General Plan) and the potential for the project to contribute to planned or unplanned growth, individually or cumulatively.

Contra Costa County plans for growth through development of its General Plan, which designates areas suitable for development. The land use designations and policies expressed in the General Plan represents how the county plans to grow, identifying the areas where growth is planned and not planned. Planned growth is represented by urban land use designations, such as residential, industrial, and commercial. Nongrowth areas include agriculture, open space, and park designations. The County General Plan is intended to present current and potential future land uses through a planning period. For example, the Contra Costa County General Plan was adopted in 1996 and represents a planning period through 2010. Applications (usually by landowners and land developers) can be made to amend a General Plan for a different land use designation at specific properties, requiring environmental and public review. The county can also revise land use designations when it updates and adopts its overall General Plan.

Growth Constraints

City and County General Plan land use designations are the primary means used to plan and manage future growth. Land use designations are supported by zoning ordinances that contain enforceable requirements to regulate development (e.g., allowable dwelling densities, minimum lot sizes, and setback requirements).

A number of land uses create physical constraints within the study area that limit the extent of future growth in the vicinity of the existing interchange. Federal Aviation Administration air space restrictions are particularly important because flight paths at Buchanan Field Airport restrict additional land use development. In the northeast quadrant of the I-680/SR-4 interchange, the Central Contra Costa Sanitary District Sewage Treatment Plant lies immediately adjacent to the diagonal ramp from

westbound SR-4 to northbound I-680. The plant has restrictive sewage and water easements through the study area and in the larger project area.

Growth Pressures

Contra Costa County is growing, and this growth is predicted to continue over the next 20 years. ABAG predicts that the county population will increase by 27.5 percent between 2000 and 2025 (ABAG Projections 2002). Over the same period, by contrast, the study area population would increase by only 11.1 percent. Meanwhile, between 2000 and 2025, economic growth for the county and study area are expected to rise by 37.2 percent and 24.3 percent, respectively.

Based on 1996 data, Contra Costa County has 33,109 ha (91,701 acres) of land available for development. This land would be sufficient to accommodate projected demand for the project design year, assuming a constant housing density of 6.25 units per ha (2.5 units per acre).

Reasonably Foreseeable Growth and Land Use Changes

The county's planned growth and land uses are not expected to change with or without the project. The I-680 and SR-4 corridors are bordered by a mix of residential, commercial, and light industrial uses. Undeveloped lands in the immediate project vicinity are generally protected from development, such as Buchanan Field Airport (and its runway approaches), Contra Costa Sanitary District lands, protected flood channels and drainage areas at Walnut and Grayson Creeks, and the Contra Costa Canal. Outside of the immediate vicinity of the interchange (from more than 0.5 mile to several miles distance), lands are primarily developed with residential, commercial, and industrial uses. Figure 2.1-2 shows planned land uses as depicted in the County and local city General Plans. A review of current aerial images of the region shows undeveloped land near the interchange that corresponds with protected hillside open space areas and public/semipublic land use designations in the General Plans. No substantial land is available or designated for growth in the geographic vicinity of the interchange.

Developable land is already in demand along both I-680 and SR-4. The existing residential developments in the interchange vicinity were approved in the past by Contra Costa County and Martinez in response to the high demand for housing. In the absence of developable land, proposals have been made to convert existing land uses. The most recent example was a preliminary concept for conversion of Buchanan Field Airport to nonaviation use, which was not carried forward primarily due to the

lack of suitable replacement lands for the existing airport facilities. To the east of the project area, plans for the future use of the Concord Naval Weapons Station are under consideration. The proposed I-680/SR-4 interchange improvements would be beneficial to existing and future traffic operations but are not expected to influence decision-making for these types of land use proposals. Access to these lands is already available from the existing freeway system. Regional freeway travel to and through the project area would be improved by providing the proposed higher-capacity freeway-to-freeway connections, but the improvements would not remove an existing bottleneck or barrier that is hindering or influencing growth.

Likewise, the project would improve traffic circulation between the freeway system and a primary local road (Pacheco Boulevard) but would not create entirely new connections or access that is not already available. The proposed slip ramp connecting northbound I-680 to Pacheco Boulevard (Phase 1) will allow drivers to avoid a low-speed loop ramp connecting northbound I-680 with westbound SR-4 and an SR-4 westbound hook-shaped exit ramp at Pacheco Boulevard. The slip ramp connecting Pacheco Boulevard with southbound I-680 (Phase 2) will allow drivers to avoid entering SR-4 at a short hook-shaped ramp from Muir Road and then quickly exiting on a diagonal ramp to southbound I-680. As noted above, these local road-to-freeway connections are already available. These changes are therefore not expected to change land use planning or decision making.

No impacts from project-related growth are expected that would affect environmental resources of concern. Because the project area is built out, most lands in the immediate vicinity of the interchange are either already disturbed by existing development or are protected. The types of sensitive environmental resources identified for this project (e.g., wetlands and waters of the United States within flood channels and drainages, potential migrating fish that may use the channelized creeks) should be avoidable or impacts can be minimized by incorporating the same measures applicable to this project.

Conclusions Regarding Potential Growth Inducement

The land use policies of the County General Plan and its supporting zoning ordinances are the primary land use controls that set forth the current and future planned growth in the project area. The approval of the proposed project would require acquisition of some parcels and portions of parcels within the proposed right-of-way but would not change the current land use designations in the overall vicinity of the interchange.

Traffic demand projections for the I-680/SR-4 corridor are consistent with the planned growth as outlined in the Contra Costa County General Plan and the Regional Transportation Plan. The proposed project is not designed for excess capacity that could induce unplanned growth during the 20-year period following construction completion.

2.1.3 Parks and Recreation

The study area encompasses three large community parks: (1) Holiday Highlands Park, located at Fig Tree Lane and Eastwoodbury Lane in Martinez; (2) Hillcrest Community Park, at Olivera Road and Grant Street in Concord; and (3) Sun Terrace Park, located at Vancouver Way and Montreal Circle in Concord.

Other parks are located outside of the study area but within the general vicinity: Morello School Park, at Morello Avenue and Morello Park Drive; Bayview Circle Park in Concord at Bayview Circle; Mountain View Park at Parkway Drive in Martinez; and John Muir Park at Vista Way in Martinez.

The parks will be unaffected by the proposed project and any related direct property takes. No visual impacts or noise impacts to the parks would occur due to the project.

2.1.4 Mitigation Measures

Existing land use planning and controls will limit potential cumulative growth impacts. No additional mitigation measures are proposed.

2.2 Hazardous Waste and 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 of 1992
- Clean Water Act
- Clean Air Act
- Safe Drinking Water Act
- Occupational Safety and Health Act
- Atomic Energy Act
- Toxic Substances Control Act
- Federal Insecticide, Fungicide, and Rodenticide Act

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.

2.2.1 Affected Environment

This section summarizes the results of an Initial Site Assessment (ISA) (Hazardous Waste Study) conducted for the proposed I-680/SR-4 Interchange Improvement Project. The purpose of the ISA was to identify environmental conditions in the study area, as defined by the American Society for Testing and Materials. Completion of the ISA was the first screening step for a hazardous waste site evaluation. The findings of the ISA indicated that vehicular traffic on I-680 and SR-4 may have contaminated the project area with aerially deposited lead from leaded gasoline used prior to its phase-out beginning in the mid 1970s. In addition, because the project area was historically used as farmland, surface soil may contain residual agricultural chemicals at concentrations that may be hazardous. A total of four potential hazardous waste sites were identified. Further investigation of the four sites

is recommended at the Plans, Specifications, and Estimates (PS&E) stage of project development.

2.2.1.1 Methods

The ISA study area included the proposed project right-of-way and adjacent properties within 0.8 km (0.5 miles) of the proposed project right-of-way. To conduct the investigation, a previous Caltrans ISA was reviewed. Publicly available records at the Contra Costa Health Services Department and the Regional Water Quality Control Board were reviewed, as well as historical aerial photographs (which can show previous land uses that might involve use or disposal of hazardous materials). A visual site reconnaissance was also performed. Environmental Data Resources, Inc. (EDR), was contacted to conduct a regulatory database search of known underground storage tanks (USTs), landfills, hazardous waste generation or treatment, storage and disposal facilities, and subsurface contamination in the study area. Based on the available information collected and reviewed, the potential for on-site contamination within the study area was assessed.

2.2.1.2 Evaluation of Sites

Potential hazardous waste sites are locations that have used or currently use hazardous material that, if spilled or leaked, could adversely affect soil and/or groundwater. Four properties were identified as potential hazardous waste sites through the regulatory database search and site reconnaissance because hazardous materials are handled on-site. These sites are located within the proposed project's right-of-way or less than 0.8 km (0.5 miles) from the proposed project area. All four sites are located within the northwestern quadrant of the project area. These properties are described in Table 2.2-1.

In addition to the sites noted above, other potentially hazardous sites were identified within the study area but outside of the proposed project right-of-way. These include IT's Vine Hill Complex, which is listed on the Toxic Pits database and located at 4585 Pacheco Boulevard, close to Arthur Road. A review of this site indicated that the groundwater is assumed to flow away from the proposed project right-of-way and any possible contamination at this site should not impact the proposed project or any of its subsequent phases. A second site at 4355 Pacheco Boulevard is a Shell gas station listed in the Leaking Underground Storage Tank (LUST) database. Remedial action is in progress at this site. The groundwater flow direction at this site is to the north away from the proposed project, and it is unlikely that any impact would result.

Other sites reviewed include the Central Contra Costa Sanitary District wastewater treatment plant facility at 5019 Imhoff Place, the Kinder Morgan petroleum products tank farm on Imhoff Road, businesses and auto repair facilities at 1919 Arnold Industrial Way, a former Exxon gas station and an active Shell gas station at 605-606 Contra Costa Boulevard, a Chevron gas station at 698 Contra Costa Boulevard, a Rotten Robbie gas station at 1090 Contra Costa Boulevard, and a portion of the Buchanan Field Airport. None of these sites were found to have the potential to impact the proposed project or subsequent phases of the I-680/SR-4 Interchange Improvement Project.

Table 2.2-1 Potential Hazardous Waste Sites

No.	Source	Facility/ Owner Name	Address/ Location	Description/Notes
1	Visual Observation	Big Tex Trailers	Between Blum Road and I-680	A trailer and recreational vehicle sales business. Vehicles are stored on the gravel surface of the lot. The site is not listed in any regulatory database. Although no observed environmental conditions are identified, soil and/or groundwater on the lot may be impacted with petroleum hydrocarbons, volatile organic compounds (VOCs), or metals released during storage or maintenance of these vehicles. Since observation was conducted from points of public access (closest possible vantage points), ground surface at the lot was not visually examined for petroleum hydrocarbon stains. Further investigation is recommended for the site.
2	EDR #59 (EDR 2002)	Bay Area Bobcat	5031 Blum Road	A Bobcat (small front-end loader) sales and maintenance shop is located on this property. The site is listed on the HAZNET database. Although no observed environmental conditions are identified, soil and/or groundwater on the lot may be impacted with petroleum hydrocarbons, VOCs, or metals released during storage or maintenance of these vehicles. Since observation was conducted from points of public access (closest possible vantage points), ground surface at the lot was not visually examined for petroleum hydrocarbon stains. Further investigation is recommended for the site.
3	Visual Observation	*NA*	Railroad crossing over I-680	A railroad crosses over I-680 on a trestle. No environmental conditions can be visually observed. However, due to railroad activity, soils and groundwater in the immediate vicinity of the tracks may be contaminated with diesel fuel and heavy metals such as lead. This kind of contamination cannot be determined from visual observation. Therefore, further investigation is recommended for the site.
4	EDR #59 (EDR 2002)	California Highway Patrol Office	Between Blum Road and I-680	The EDR report states the site is listed on the UST-HIST and State UST databases. Although no observed environmental conditions were identified, soil and/or groundwater on the lot may be impacted with petroleum hydrocarbons, VOCs, or metals released during storage or maintenance of highway patrol vehicles. Since the site is immediately adjacent to the proposed project right-of-way, any possible soil and groundwater contamination at this site may impact the right-of-way. Further investigation is recommended for the site.

2.2.2 Permanent and Temporary Impacts

The results of the ISA indicate that the most likely contaminants potentially present within the project area would be pesticides and lead in surface soil. A low potential exists for hydrocarbon-impacted soil and groundwater to be present due to fueling storage or maintenance of vehicles. Further investigations on the four identified properties are recommended prior to construction to evaluate the potential for hydrocarbon impacts. Testing of soil samples within the project area should be performed to determine any need to manage excavated or graded soils potentially contaminated with lead, pesticides, or hydrocarbons. Completion of these studies prior to construction avoids unnecessary delays and helps ensure work safety.

2.2.3 Mitigation Measures

Prior to construction, steps would be taken to verify whether site contamination in the study area might impact the proposed project or subsequent phases of the interchange improvement. The proposed steps would include but are not limited to the following:

- **Investigations of all buildings acquired for the project.** The ISA did not address any potential contamination issues regarding existing structures. Because the project would involve the acquisition of commercial and residential properties, these structures should be investigated for potential hazardous materials or contamination issues prior to construction. The investigations should include checking for the presence of building materials painted with lead-based paint, storage buildings that might contain hazardous materials, asbestos (i.e., transit pipe, insulation, and siding), home heating fuel storage tanks, and other similar issues.
- **Soil and groundwater sampling.** Further investigation of the four identified potential hazardous waste sites is recommended prior to construction to evaluate the potential for hydrocarbon impacts. Soil sampling and analysis will be required if the excavated material is used on-site, disposed of off-site in a landfill, or reused off-site. This sampling and analysis should be conducted prior to construction. Although none of the reports and databases reviewed indicates that the proposed project right-of-way or the right-of-way of future project phases are likely to be contaminated, potential hazards or construction delays would be avoided by early investigation.

Where contamination is present, a remediation plan that complies with State and Federal standards would be developed and implemented in cooperation with the current landowner.

2.3 Air Quality

Regulatory Setting

The Clean Air Act as amended in 1990 is the federal law that governs air quality. Its counterpart in California is the California Clean Air Act of 1988. These laws set standards for the quantity of pollutants that can be in the air. At the federal level, these standards are called National Ambient Air Quality Standards (NAAQS). Standards have been established for six criteria pollutants that have been linked to potential health concerns; the criteria pollutants are: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM), lead (Pb), and sulfur dioxide (SO_2).

Under the 1990 Clean Air Act Amendments, the U.S. Department of Transportation cannot fund, authorize, or approve Federal actions to support programs or projects that are not first found to conform to State Implementation Plan for achieving the goals of the Clean Air Act requirements. Conformity with the Clean Air Act takes place on two levels—first, at the regional level and second, at the project level. The proposed project must conform at both levels to be approved.

Regional level conformity in California is concerned with how well the region is meeting the standards set for CO, NO_2, O_3, and PM. California is in attainment for the other criteria pollutants. At the regional level, Regional Transportation Plans (RTP) are developed that include all of the transportation projects planned for a region over a period of years, usually at least 20. Based on the projects included in the RTP, an air quality model is run to determine whether or not the implementation of those projects would conform to emission budgets or other tests showing that attainment requirements of the Clean Air Act are met. If the conformity analysis is successful, the regional planning organization, such as the Metropolitan Transportation Commission for the San Francisco Bay Area, and the appropriate federal agencies, such as the Federal Highway Administration, make the determination that the RTP is in conformity with the State Implementation Plan for achieving the goals of the Clean Air Act. Otherwise, the projects in the RTP must be modified until conformity is attained. If the design and scope of the proposed transportation project are the same as described in the RTP, then the proposed project is deemed to meet regional conformity requirements for purposes of project-level analysis.

Conformity at the project-level also requires "hot spot" analysis if an area is "nonattainment" or "maintenance" for CO and/or particulate matter. A region is a "nonattainment" area if one or more monitoring stations in the region fail to attain the relevant standard. Areas that were previously designated as nonattainment areas but

have recently met the standard are called "maintenance" areas. "Hot spot" analysis is essentially the same, for technical purposes, as CO or particulate matter analysis performed for NEPA purposes. Conformity does include some specific standards for projects that require a hot spot analysis. In general, projects must not cause the CO standard to be violated, and in "nonattainment" areas the project must not cause any increase in the number and severity of violations. If a known CO or particulate matter violation is located in the project vicinity, the project must include measures to reduce or eliminate the existing violation(s) as well.

2.3.1 Affected Environment

2.3.1.1 Climate, Meteorology, and Topography

Air quality in the Bay Area is a function of pollutants emitted locally and regionally combined with the meteorological and topographic factors that influence dispersion and the intrusion of pollutants generated outside of the region. Given the topographic diversity of the Bay Area, the region's meteorology and climate can be described in terms of different subregions and their associated microclimates. The I-680/SR-4 interchange is located at the border of the Carquinez Strait and the Diablo Valley. The Carquinez Strait area has prevailing winds that flow from the west to the east. Occasionally, regional atmospheric pressure patterns will reverse, causing an east-to-west airflow through the strait, elevating temperatures and pollutant levels. The Diablo Valley is a broad valley with the Carquinez Strait at its north end and the narrower San Ramon Valley to its south. The Coast Range on the west side of the Diablo Valley blocks much of the marine air from reaching the valley, allowing for generally mild wind speeds, inversion layers, and higher pollution potential. In the summer, ozone can be transported into the valley from both the Central Valley and the central Bay Area.

2.3.1.2 Air Quality Pollutants of Concern in the Bay Area

National and State air quality standards have been established for six ambient air pollutants (referred to as criteria pollutants): ozone (O_3), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), particulate matter less than 10 micrometers in diameter (PM_{10}), fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), and lead. State and national ambient air quality standards (NAAQS) for criteria pollutants are listed in Table 2.3-1.

Table 2.3-1 Bay Area Attainment Status

Pollutant	Averaging Time	California Standards[1]		National Standards[2]	
		Concentration	Attainment Status	Concentration[3]	Attainment Status
Ozone	8 Hour	0.070 ppm (137 µg/m^3)	N[9]	0.075 ppm (1557 µg/m^3)	N[4]
	1 Hour	0.09 ppm (180 µg/m^3)	N		--[5]
Carbon Monoxide	8 Hour	9.0 ppm (10 mg/m^3)	A	9 ppm (10 mg/m^3)	--[6]
	1 Hour	20 ppm (23 mg/m^3)	A	35 ppm (40 mg/m^3)	A
Nitrogen Dioxide	1 Hour	0.18 ppm (338 µg/m^3)	A	NA	NA
	Annual Average	0.30 ppm (56 mg/m^3)	NA	0.053 ppm (100 µg/m^3)	A
	24 Hour	0.04 ppm (105 µg/m^3)	A	0.14 ppm (365 µg/m^3)	A
Sulfur Dioxide (SO_2)	1 Hour	0.25 ppm (655 µg/m^3)	A	NA	NA
	Annual Average	NA	NA	(0.030 ppm) 80 µg/m^3	A
Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 µg/m^3	N[6]	NA	NA
	24 Hour	50 µg/m^3	N	150 µg/m^3	U[7]
Particulate Matter – Fine ($PM_{2.5}$)	Annual Arithmetic Mean	12 µg/m^3	N[7]	15 µg/m^3	A
	24 Hour	NA	NA	35 µg/m$^{3(10)}$	U
Sulfates	24 Hour	25 µg/m^3	A	NA	NA
Lead	Calendar Quarter	NA	NA	1.5 µg/m^3	A
	30 Day Average	1.5 µg/m^3	A	NA	NA
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	U	NA	NA
Vinyl Chloride (chloroethene)	24 Hour	0.010 ppm (26 µg/m^3)	U	NA	NA
Visibility Reducing particles	8 Hour (1000 to 1800 PST)	--[8]	U	NA	NA

Source: BAAQMD Web site, updated May 8, 2008

A=Attainment N=Nonattainment U=Unclassified

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

Notes:

1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, suspended particulate matter - PM_{10}, and visibility reducing particles are values that are not to be exceeded. The standards for sulfates, Lake Tahoe carbon monoxide, lead, hydrogen sulfide, and vinyl chloride are not to be equaled or exceeded. If the standard is for a 1-hour, 8-hour or 24-hour average (i.e., all standards except for lead and the PM_{10} annual standard), then some measurements may be excluded. In particular, measurements are excluded that ARB determines would occur less than once per year on the average.
2. National standards other than for ozone, particulates and those based on annual averages are not to be exceeded more than once a year. The 1-hour ozone standard is attained if, during the most recent three-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than one. The 8-hour ozone standard is attained when the 3-year average of the 4th highest daily concentrations is 0.08 ppm or less. The 24-hour PM_{10} standard is attained when the 3-year average of the 99th percentile of monitored concentrations is less than 150 µg/m^3. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of 98th percentiles is less than 65 µg/m^3. Except for the national particulate standards, annual standards are met if the annual average falls below the standard at every site. The national annual particulate standard for PM_{10} is met if the 3-year average falls below the standard at every site. The annual $PM_{2.5}$ standard is met if the 3-year average of annual averages spatially averaged across officially designed clusters of sites falls below the standard.
3. National air quality standards are set at levels determined to be protective of public health with an adequate margin of safety.
4. In 2004, the Bay Area was designated as a marginal nonattainment area of the national 8-hour standard.
5. The national 1-hour ozone standard was revoked by the USEPA on June 15, 2005.
6. In April 1998, the Bay Area was redesignated to attainment for the national 8-hour CO standard.
7. In June 2002, CARB established new annual standards for $PM_{2.5}$ and PM_{10}.
8. Statewide VRP Standard (except Lake Tahoe Air Basin): Particles in sufficient amount to produce an extinction coefficient of 0.23 per km when the relative humidity is less than 70 percent. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.
9. The 8-hour CA ozone standard was approved by the Air Resources Board on April 28, 2005, and became effective on May 17, 2006.
10. The USEPA lowered the 24-hour $PM^{2.5}$ standard from 65 µg/m^3 to 35 µg/m^3 in 2006. The USEPA is required to designate the attainment status of BAAQMD for the new standard by December 2009.

The major criteria pollutants of concern in the Bay Area air basin are described below.

- O_3 is a secondary pollutant that forms in the atmosphere as a result of the interaction between ultraviolet light, reactive organic gases (ROGs), and NO_x. ROG and NO_x are generated by motor vehicle exhaust and stationary sources. Air quality programs for O_3 focus on reductions of mobile source emissions. Substantial reductions in O_3 have been achieved through the State-mandated vehicle inspection program. The Bay Area does not attain the national or State 8-hour ambient standards for this pollutant. In 2004, the U.S. Environmental Protection Agency (USEPA) issued a finding that the Bay Area has achieved attainment of the 1-hour national standard but must demonstrate compliance with an adopted maintenance program. The Bay Area Air Quality Management District (BAAQMD) has an approved Ozone Attainment Plan to reduce O_3 concentrations.
- ROGs are important components of ozone formation, and their emissions contain gases that are toxic compounds. The primary sources of ROGs are petroleum transfer and storage, mobile sources, and organic solvents. Though no ambient standards exist for ROGs, the regional air quality attainment plan contains many control measures to reduce these gases as they are O_3 precursors.
- NO_x is created during the combustion of fossil fuels under high temperature and pressure. The Bay Area is in attainment of the national and State ambient standards of this pollutant, but this pollutant contributes to O_3 formation.
- PM_{10} and $PM_{2.5}$ consist of atmospheric particles resulting from many sources, including industrial and agricultural operations, motor vehicle tire wear, combustion, atmospheric photochemical reactions, burned agriculture waste, construction activities, and wind-raised dust. PM_{10} may generally be referred to as "coarse particles" and $PM_{2.5}$ as "fine particles," relative to their aerodynamic diameter (measured in micrometers). The Bay Area is designated as unclassified for the national ambient standard for PM_{10} and nonattainment of the State ambient standard. The Bay Area is designated as unclassified/attainment for the national $PM_{2.5}$ standard and nonattainment for the State standard.
- CO is an odorless, invisible gas usually formed as the result of incomplete combustion of organic substances. Motor vehicles are a primary source of CO. Carbon monoxide tends to dissipate rapidly into the atmosphere. Consequently, violations of the CO standard are generally limited to major intersections during peak-hour traffic conditions. The Bay Area is in attainment of the national

ambient standard for this pollutant, although the region is also one of 10 in California included in a CO maintenance plan. The Bay Area is in attainment of the state CO standard.

- Sulfur oxides can damage and irritate lung tissue, accelerate the corrosion of exposed materials, and harm vegetation. SO_2 is a colorless gas created by the combustion of sulfur-containing fossil fuels. The Bay Area is in attainment of the national and State ambient standards for this pollutant.
- Lead is a metal that was used to increase the octane rating in auto fuel, a practice that is no longer allowed. The Bay Area is in attainment of the national and State standards for this pollutant.

2.3.1.3 Regulatory and Attainment Status

Within the project vicinity, air quality is monitored, evaluated, and controlled by the USEPA, California Air Resources Board (CARB), and BAAQMD. These three agencies develop rules and regulations to attain the goals or directives imposed by legislation. The major elements of this air quality regulatory framework are summarized below, as they might pertain to the review of the proposed project.

The project area is subject to air quality planning programs established by the Federal Clean Air Act of 1970 and the California Clean Air Act of 1988. The 1990 Federal Clean Air Act Amendments require that each state have an air pollution control plan called a State Implementation Plan (SIP). The SIP, which is reviewed by the USEPA, includes strategies and control measures to attain the NAAQS by deadlines established by the Federal Clean Air Act. As described in Section 2.3.1.5, federally funded transportation projects such as the I-680/SR-4 interchange project must be included in a regional transportation plan (RTP)—the *Transportation 2030 Plan* (MTC 2005)—and Transportation Improvement Program (TIP)[6] (MTC 2006) that demonstrate the achievement of the air quality goals of the SIP. Plans may also include interim milestones for progress toward attainment.

The USEPA has classified air basins (or portions thereof) as being in attainment, nonattainment, or unclassified for each criteria air pollutant, based on whether the NAAQS have been achieved. An area is designated unclassified when insufficient air quality data are available on which to base an attainment or nonattainment designation. The USEPA classifies the Bay Area air basin as being in marginal

nonattainment for O_3 for the national 8-hour standard, and in attainment or unclassified for lead, NO_x, PM_{10}, and SO_2. The Bay Area/Contra Costa County is classified as a maintenance area for CO, meaning that the area had a history of nonattainment for this pollutant but now meets the NAAQS.

The CARB regulates mobile emissions sources and oversees the activities of county and regional air quality management districts. The CARB regulates local air quality indirectly by establishing vehicle emission standards through its planning, coordinating, and research activities.

California has adopted ambient standards that are more stringent than the national standards for the criteria air pollutants. Under the California Clean Air Act, areas are also designated as being in attainment, in nonattainment, or unclassified with respect to the State ambient air quality standards. The California Clean Air Act requires that districts design a plan to achieve an annual reduction of 5 percent or more in districtwide emissions for each nonattainment criteria pollutant or its precursor(s).[7] The Bay Area air basin is in nonattainment for the State O_3 and particulate matter standards. The air basin is designated as an attainment area for State CO, lead, NO_x, sulfate, and sulfur oxide (SO_x) standards.

The BAAQMD has jurisdiction over air quality in the Bay Area air basin and regulates most air pollutant sources except for motor vehicles, locomotives, aircraft, agriculture equipment, and marine vessels. In 1996, the BAAQMD published its CEQA Guidelines (revised in 1999), which advises local jurisdictions on procedures for addressing air quality in environmental documents. The BAAQMD coordinates with the ABAG and MTC in the development and implementation of the transportation plans required by the Federal and State Clean Air Acts.

2.3.1.4 Existing Air Quality

Table 2.3-2 provides a four-year summary of ambient air quality measured at the two air quality monitoring stations closest to the proposed project site. The Pittsburg air quality monitoring site is located in the Carquinez Strait region, and the Concord air quality monitoring site is located in the Diablo Valley. The monitoring station in Pittsburg is approximately 12 km (7.5 miles) from the proposed project, on the

[6] The RTP and TIP are long-term plans produced by a regional transportation planning agency—in this case, the MTC—that specifies how Federal, State, and local transportation funds will be spent in the region.

[7] A precursor is a compound that chemically reacts with another to form a criteria air pollutant. For example, organic compounds are precursors for ozone.

Table 2.3-2 Ambient Pollutant Concentrations in the Project Vicinity

Parameter	2005	2006	2007
Ambient O_3 levels (ppm)			
Concord, 2975 Treat Blvd.			
Highest 1-hour concentration	0.098	0.117	0.105
Measured days > State standard	1	8	1
Measured days > National standard	0	0	0
Highest 8-hour concentration	0.081	0.093	0.081
Measured days > National standard	0	4	0
Pittsburg, 10th Street			
Highest 1-hour concentration	0.094	0.105	0.100
Measured days > State standard	0	3	1
Measured days > National standard	0	0	0
Highest 8-hour concentration	0.079	0.094	0.075
Measured days > National standard	0	1	0
Ambient CO levels (ppm)			
Concord, 2975 Treat Blvd.			
Highest 8-hour concentration	1.51	1.30	1.41
Pittsburg, 10th Street			
Highest 8-hour concentration	1.73	1.92	1.50
Ambient NO_2 levels (ppm)			
Concord, 2975 Treat Blvd.			
Highest 1-hour concentration	0.055	0.047	0.049
Annual average	0.012	1.011	0.011
Pittsburg, 10th Street			
Highest 1-hour concentration	0.058	0.052	0.051
Annual average	0.011	0.011	0.010
Ambient SO_2 levels (ppm)			
Concord, 2975 Treat Blvd.			
Highest 24-hour concentration	0.008	0.006	0.010
Annual average	0.001	0.001	0.001
Pittsburg, 10th Street			
Highest 24-hour concentration	0.010	0.009	0.008
Annual average	0.002	0.002	0.002
Ambient PM_{10} levels (micrograms/cubic meter)			
Concord, 2975 Treat Blvd.			
Highest 24-hour concentration	47.2	83.6	52.4
Measured days > State standard	0	3	2
Measured days > National standard	0	0	0
State annual geometric mean	16.4	18.5	16.8
National annual arithmetic mean	15.9	18.1	16.4
Pittsburg, 10th Street			
Highest 24-hour concentration	57.0	58.9	59.0
Measured days > State standard	1	2	4
Measured days > National standard	0	0	0
State annual geometric mean	20.1	19.9	19.4
National annual arithmetic mean	19.5	19.4	18.8
Ambient $PM_{2.5}$ levels (micrograms/cubic meter)			
Concord, 2975 Treat Blvd.			
Highest 24-hour concentration	40.9	16.0	--
Measured days > State standard	--	--	--
Measured days > National standard	0	0	0
State and National annual geometric mean not recorded/reported			

Source: CARB Air Quality Data Web Site (http://www.arb.ca.gov/aqd/aqdpage.htm), accessed June 2008.

outskirts of the City of Pittsburg near several large industrial facilities. This monitoring station is in a location that has prevalent winds typical for the Carquinez Strait. The Concord monitoring station is located approximately 5.2 km (3.2 miles) from the proposed project at 2975 Treat Boulevard. This monitoring station is located at the north end of the Diablo Valley and is adjacent to a heavily congested intersection. The region's air quality standards and status is discussed below.

2.3.1.5 Transportation Conformity with Air Quality Plans

Phases 1 and 2 of the I-680/SR-4 Interchange Improvement Project are programmed for Federal transportation project funding. Transportation projects receiving Federal funding must demonstrate that they do not exceed the emissions inventory allowance in the SIP and, therefore, conform to the current SIP. The SIP describes how a state will maintain or meet NAAQS. Each region in the state submits its emissions allowances and strategies for reducing emissions of air pollutants that are above NAAQS to the CARB, which prepares the SIP.

Applicable Air Quality Plans

Applicable regulatory air quality plans (which are elements of the SIP) are listed as follows and explained below. These plans were adopted in response to monitored pollutant levels that did not meet Federal standards.

Pollutant	Applicable Implementation Plan or SIP
CO	2004 Revision to the California State Implementation Plan for CO, Updated Maintenance Plan for Ten Federal Planning Areas (updates the 1996 CO Maintenance Plan). Effective on January 30, 2006.
O_3	Bay Area 2005 Ozone Strategy, adopted January 4, 2006, and 2001 Ozone Attainment Plan, S.F., Bay Area (amends the S.F. Bay Area Ozone Attainment Plan for the 1-hour National Ozone Standard, adopted June 1999).

For CO, the SIP was revised and adopted in 1996 to document that the Bay Area was one of 10 areas in the State that had attained the Federal 8-hour CO standard and had demonstrated measures to maintain compliance with the standard. In 2007, monitored ambient CO levels reported by CARB for the project area were less than 2 ppm, or approximately 20 percent of the Federal standard. In 2005, CARB proposed to extend the existing CO maintenance plan to 2018, which was adopted by USEPA in January 2006.

CARB adopted a SIP revision for O_3 in 1999. Portions of the SIP revision were approved, but USEPA also determined that the plan had deficiencies requiring

corrective action. In response to the USEPA action, the plan was revised in 2001, and most of it was approved in 2003. Subsequent monitoring data showed that the Bay Area was in compliance of the 1-hour standard. USEPA agreed in 2004 that the Bay Area has met the national 1-hour standard but the agency will not formally redesignate the area as attainment until compliance with an approved maintenance plan is demonstrated. The 2005 plan was adopted to achieve attainment of the State 1-hour standard.

Transportation planning is coordinated with this conformity process. The RTP contains a long-range plan for transportation projects and estimated costs of each project. The TIP also contains planned transportation projects but is more restrictive: the projects in the TIP must be funded or partially funded within a 3-year planning period. The RTP and TIP are consequently updated on a regular basis to reflect changes in priorities, project costs, and timing. The air quality evaluations for updated RTPs and TIPs include emissions allowances for designated or planned projects within the jurisdiction of a local regional transportation agency (i.e., the MTC). All projects included in the TIP must be derived from or be consistent with the RTP. The TIP must conform to the SIP by having emissions allowances for the planned projects that do not exceed the emissions allowance in the SIP. For an individual project to conform to the SIP, it must be contained in a "conforming" TIP that meets this criteria.

The I-680/SR-4 Interchange Improvement Project meets these federal conformity requirements. The latest conformity analyses and determination performed by MTC is consistent with the current project, and a new conformity determination is not required. For the Bay Area, the RTP and TIP are the subjects of an air quality conformity analysis, which is a determination of whether transportation activities will produce new air quality violations or delay timely attainment of NAAQS. The MTC's 2007 air quality conformity analysis was initiated in January 2006 with a consultation request to partner agencies, asking that they submit any new projects for addition to the TIP. The process also incorporated public consultation and was developed in compliance with FHWA regulations and guidance on financial constraint. MTC's air quality evaluation used the latest available socioeconomic and land use forecasts from ABAG's Projections 2005 and the latest MTC travel demand model (BAYCAST) (MTC 2007a), which are less than 5 years old.

The proposed project is included in the most recently adopted RTP, the *Transportation 2030 Plan* (RTP IDs# 21205 and 22350). The project is included in the most recent TIP,

which was adopted by the MTC on July 26, 2006 (MTC Resolution #3755, TIP ID# CC 010023). The MTC also determined on July 26, 2006, that the RTP and the 2007 TIP are in conformity with the SIP (MTC Resolution No. 3756) (MTC 2007b). The TIP subsequently received approval from FHWA and Federal Transit Administration on October 2, 2006. The design concept, scope, and opening year of the project have not changed significantly since its inclusion in the latest TIP. The project is therefore in conformity with the SIP and will not interfere with timely implementation of any Transportation Control Measure in the applicable SIP.

2.3.2 Permanent Impacts

Air quality issues relate to a range of different pollutants and their individual regulatory standards. The evaluation of air quality impacts addressed in this section focuses on the project's conformity with the regional air quality framework (discussed in Section 2.3.1) and the project's potential to result in an adverse impact to the region's compliance with the relevant standards.

2.3.2.1 SIP Conformity

This project is in conformity with the SIP and is included in adopted regional traffic and air quality evaluations (see Section 2.3.1.5).

2.3.2.2 Evaluation of Potential for Traffic-Related CO Impacts

The CO impacts analysis followed the procedures in *Transportation Project-Level Carbon Monoxide Protocol*, prepared by the University of California, Davis, Institute of Transportation Studies (CO Protocol; Garza, Graney, and Sperling 1998). This protocol applies screening procedures, based on the attainment status of the area in which the project is planned, to evaluate potential CO impacts of the project and assess the need for any further detailed analysis. The project is within a CO maintenance area where continued attainment of the Federal CO standard has been verified. The area is in attainment for the State CO standard. The project is included in a conforming RTP and TIP. Based on the CO Protocol, the screening procedure in "Level 7" was followed to screen the build vs. no build alternatives for the following criteria:

a. **The project would not significantly increase the percentage of vehicles operating in cold-start mode**. The project would not open up or provide new access to the freeway or local roads of any lands that are not already developed in the Pacheco and Concord area. Vehicles using the interchange would already have traveled a sufficient distance to not be in cold start mode. The project would

not result in substantial changes to local street access, road configuration, or land use that would affect existing or future vehicle operating conditions or cold start mode. No change is expected in vehicle operating mode as a result of the project.

b. **The project would not significantly increase traffic volumes**. The percent changes in peak traffic volumes with and without the project are 2.6 percent in the morning peak period and 3.6 percent in the evening peak period. These maximum predicted changes are less than 5 percent. The proposed project would maintain or improve levels of service within the study area, and thus there will be no reduction in average speeds.

c. **The project would not worsen traffic flow**. The project would improve traffic flow through the interchange. The implementation of the funded phases of the project (Phases 1 and 2) would address some of the deficiencies that impede traffic flow at the interchange. The improvements will alleviate bottlenecks, remove the volume constraints on southbound I-680 during the AM peak hour and northbound I-680 during the PM peak hour, and result in freeway operations improvements on I-680 south of SR-4 and on SR-4 west of I-680. The increased freeway capacity would result in diversion of traffic from surface streets to the freeway, which would improve operations due to decreases in through traffic volumes.

Following the protocol methods, a comparison was also made of the proposed interchange facility with an existing interchange in the same air district, in this case the U.S. Highway 101 (US 101)/Tully Road interchange in San Jose (Table 2.3-3).

The I-680/SR-4 interchange facility carries less traffic than the comparison location, even following the proposed improvements (which would improve ramp connections but not add mainline traffic volume capacity). The project location in Contra Costa County has recorded CO levels well below both the CO standard and the comparison location's level. The proposed is in an area that continues to meet air quality standards (within a CO maintenance area), and the documentation satisfies the conditions in the CO Protocol supporting a conclusion that there is no reason to expect higher concentrations at the project location than the comparative facility/location. Therefore, the project is not expected to cause an exceedance of state or federal CO standards. FHWA reviewed the air quality conformity determination information and concluded that the project conforms to the SIP; their determination is included in Appendix H.

Table 2.3-3 Comparison of Project to an Existing Interchange per CO Protocol Criteria

Parameter	I-680/SR-4 Interchange (Build/Project)	U.S. 101/Tully Road Interchange (Existing/Comparison)
Receptor Distance	100 feet	100 feet
Roadway Geometry	Cloverleaf interchange I-680 = 6 lanes SR-4 = 6 lanes	Cloverleaf interchange US 101 = 8 lanes plus collector-distributor roads Tully Road = 6 lanes
Worst-Case Meteorology	Coastal Valley	Coastal Valley
AADT Mainline Volumes[1]	146,000 (I-680 to west of interchange) 127,000 (I-680 to east of interchange)	186,000 (US 101 to north of interchange) 228,000 (US 101 to south of interchange)
Hot/Cold Starts	50/10	50/10
Percent Heavy Duty Gasoline Trucks[2]	2.7 to 6.8	6
8-Hour Background (CO)[3] **(2007 highest daily reported)**	1.41 ppm (Concord, 2975 Treat Blvd) 1.50 ppm (Pittsburg, 10th Street)	2.71 ppm (San Jose, Jackson Street)

[1] *Source:* 2006 Caltrans Traffic and Vehicle Data Systems Unit (http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/2006all.htm)
[2] Truck AADT is from 2006 Annual Average Daily Truck Traffic on the California State Highway System. The component of heavy duty gasoline trucks as part of the truck count is not available; the value listed represents all trucks, of which a portion would be heavy duty gasoline trucks. The same data source was used for both facilities compared in this table.
[3] CARB (http://www.arb.ca.gov/adam/cgi-bin/db2www/adamtop4b.d2w/Branch) for 2007 reporting year.

2.3.2.3 Particulate Matter "Hot Spot" Analysis

A qualitative particulate "hot spot" analysis or discussion is required for transportation projects that are funded or approved by FHWA or the Federal Transit Administration and are in federal PM_{10} nonattainment or maintenance areas. This project is in an area that is in attainment or unclassified for the federal PM_{10} and $PM_{2.5}$ standards. Qualitative hot-spot analyses for PM_{10} and $PM_{2.5}$ are therefore not required for project-level conformity purposes.

2.3.2.4 Regional Air Pollutant Cumulative Impact Analysis

Emissions of ozone precursors (NO_x and ROG), CO, and PM_{10} are addressed in the RTP regional air quality analysis, which included Phases 1 and 2. To evaluate the contributions from Phases 3 through 5, regional emissions of criteria pollutants from all project-related vehicle trips were calculated. The emissions were based on estimates of vehicle trips associated with Phases 3 through 5. The traffic analysis showed an increase in the number of daily trips with Phases 3 through 5 from vehicles using I-680 and SR-4 instead of diverting to surface streets or using other

freeways, as they do under No Project conditions. A comparison of the calculated daily emissions and the BAAQMD thresholds is shown in Table 2.3-4.

Table 2.3-4 Calculated Daily Emissions and BAAQMD Significance Thresholds

Pollutant	Estimated Daily Emissions (lbs/day)	BAAQMD Significance Thresholds (lbs/day)
ROG	2.0	82
CO	23.5	550
NO_x	4.2	82
SO_2	0.1	--
PM_{10}	0.8	82

The BAAQMD provides methods and thresholds for evaluating significance under CEQA. No corresponding methods have been approved for NEPA evaluation by FHWA for calculating some pollutants such as PM_{10}. None of the calculated emission totals approached or exceeded the significance thresholds published by the BAAQMD. No numerical significance threshold for SO_2 exists, but SO_2 is an attainment pollutant in the Bay Area and SO_2 emissions from motor vehicles are minimal. Overall, the increase in regional criteria air pollutants as a result of completion of all five project phases would not constitute a substantial impact with regard to BAAQMD's CEQA thresholds.

2.3.3 Mobile Source Air Toxics

In addition to the criteria air pollutants for which standards exist, the USEPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources. Mobile source air toxics (MSATs) are a subset of the air toxics defined by the Clean Air Act. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

This section includes a basic analysis of the likely MSAT emission impacts of the proposed project. Available technical tools do not enable prediction of project-specific health impacts of the emission changes associated with this project. Due to

these limitations, the following discussion is included in accordance with Council on Environmental Quality regulations (40 Code of Federal Regulations 1502.22[b]).

Evaluating the environmental and health impacts from MSATs on a proposed highway project requires several key elements, including emissions modeling; dispersion modeling to estimate ambient concentrations resulting from the estimated emissions; exposure modeling to estimate human exposure to the estimated concentrations; and final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project. Detail on these limitations is provided in FHWA guidance on air toxic analysis.[8]

As discussed above, technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this project. However, even though no reliable methods exist that accurately estimate the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future MSAT emissions under the project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can provide a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled "A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives" (FHWA 2006).

For the proposed project and the No Project Alternative, the amount of MSATs emitted would be proportional to the vehicle miles traveled (VMT), assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for the proposed project is slightly higher than that for the No Project Alternative, because the additional capacity would increase the efficiency of the roadway and attract rerouted trips from elsewhere in the transportation network. In 2030, peak VMT would increase from 1,510,980 to 1,521,870 for Phases 1 and 2 (an increase of 0.72 percent), and to 1,537,970 with all five phases completed (an increase of 1.8 percent). These increases in VMT would lead to higher MSAT emissions for the proposed project in the vicinity of the interchange, along with a corresponding decrease in MSAT emissions along the routes from which traffic is

[8] FHWA Guidance on Air Toxic Analysis in NEPA Documents (2006), URL: www.fhwa.dot.gov/environment/airtoxic/020306guidmem.htm

diverted (local streets in the vicinity of the interchange). The emissions increase is offset somewhat by lower MSAT emission rates due to increased speeds; according to the USEPA's MOBILE6 emissions model, emissions of all of the priority MSATs except for diesel particulate matter decrease as speed increases. The extent to which these speed-related emissions decreases will offset VMT-related emissions increases cannot be reliably projected due to the inherent deficiencies of the technical models.

Because the estimated VMT varies by 5 percent or less between the proposed project and No Project Alternative, no appreciable difference in overall MSAT emissions is expected. Also, regardless of the alternative or chosen or phases constructed, emissions will likely be lower than current levels in future years as a result of USEPA national programs that are projected to reduce MSAT emissions by 57 to 87 percent between 2000 and 2020. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the USEPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

The additional ramp connections included in the proposed project would move some traffic closer to homes and businesses, primarily at Phase 2 in the southwest quadrant of the interchange, with the addition of the new westbound SR-4 to southbound I-680 connector and slip ramp. This would incrementally increase concentrations of MSATs in the vicinity of this change compared to the No Project Alternative. However, as discussed previously, the magnitude and duration of this change cannot be accurately quantified due to limitations of the emissions and dispersion models, and could be offset due to increases in speeds and reductions in congestion, which are associated with lower MSAT emissions. The USEPA's vehicle and fuel regulations, combined with fleet turnover, will over time cause substantial reductions in regionwide MSAT levels.

2.3.4 Construction Impacts

Construction is a source of dust emissions that can have temporary impacts on local air quality (i.e., exceedances of the State air quality standards for PM_{10}). Construction emissions would result from earth moving and heavy equipment use involved in land clearing, ground excavation, cut and fill operations, and the construction of the project facilities. Dust emissions would vary from day to day depending on the level of activity, the specific operations, and the prevailing weather.

In addition to particulate emissions from earth moving, combustion emissions (CO, NO_x, PM_{10}, and ROG) from construction equipment may create a temporary impact on local air quality. Such equipment is typically diesel fueled and can contribute NO_x and PM_{10} emissions during the construction period.

Construction will involve the demolition and removal of structures and building materials, some of which may contain asbestos (see Section 2.2.3). Structures should be investigated for potential hazardous materials prior to construction. The project area appears to have a low likelihood of naturally occurring asbestos, as the site geology consists of marine and estuarine sediments, and the project location is not within a mapped area of naturally occurring asbestos (CARB 2000).

2.3.5 Mitigation

No substantial impacts to air quality would result from operation of Phases 1 and 2, or from the cumulative implementation of Phases 1 through 5. To mitigate potential construction impacts, dust control practices would be employed to minimize or avoid potential exceedances (violations) of the PM_{10} air quality standard during construction. Mitigation measures that would be employed include the following (in accordance with BAAQMD CEQA Guidelines):

- Water all active construction areas at least twice daily.
- Cover all trucks hauling soil, sand, and other loose materials *or* require all trucks to maintain at least 0.6 meter (2 feet) of freeboard.
- Pave, apply water three times daily, or apply nontoxic soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites.
- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
- Hydroseed or apply nontoxic soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).
- Enclose, cover, water twice daily or apply nontoxic soil binders to exposed stockpiles (dirt, sand, etc.)
- Limit traffic speeds on unpaved roads to 24 km per hour (15 miles per hour).

- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- Replant vegetation in disturbed areas as quickly as possible.

In addition, the following can mitigate pollutant emissions in construction equipment exhaust:

- Keeping engines properly tuned
- Limiting idling
- Avoiding unnecessary concurrent use of equipment

The proposed measures would be implemented for the construction of Phases 1 through 5. Implementation of the above mitigation measures would result in construction emissions occurring at a less than substantial level.

2.4 Noise

Regulatory Setting

NEPA and CEQA provide the broad basis for analyzing and abating highway traffic noise effects. The intent of these laws is to promote the general welfare and to foster a healthy environment. The requirements for noise analysis and consideration of noise abatement and/or mitigation, however, differ between NEPA and CEQA.

California Environmental Quality Act

CEQA requires a strictly baseline versus build analysis to assess whether a proposed project will have a noise impact. If a proposed project is determined to have a significant noise impact under CEQA, then CEQA dictates that mitigation measures must be incorporated into the project unless such measures are not feasible.

National Environmental Policy Act and 23 CFR 772

For highway transportation projects with FHWA (and the Department, as assigned) involvement, the federal-Aid Highway Act of 1970 and the associated implementing regulations (23 CFR 772) govern the analysis and abatement of traffic noise impacts. The regulations require that potential noise impacts in areas of frequent human use be identified during the planning and design of a highway project. The regulations contain noise abatement criteria (NAC) that are used to determine when a noise impact would occur. The NAC differ depending on the type of land use under

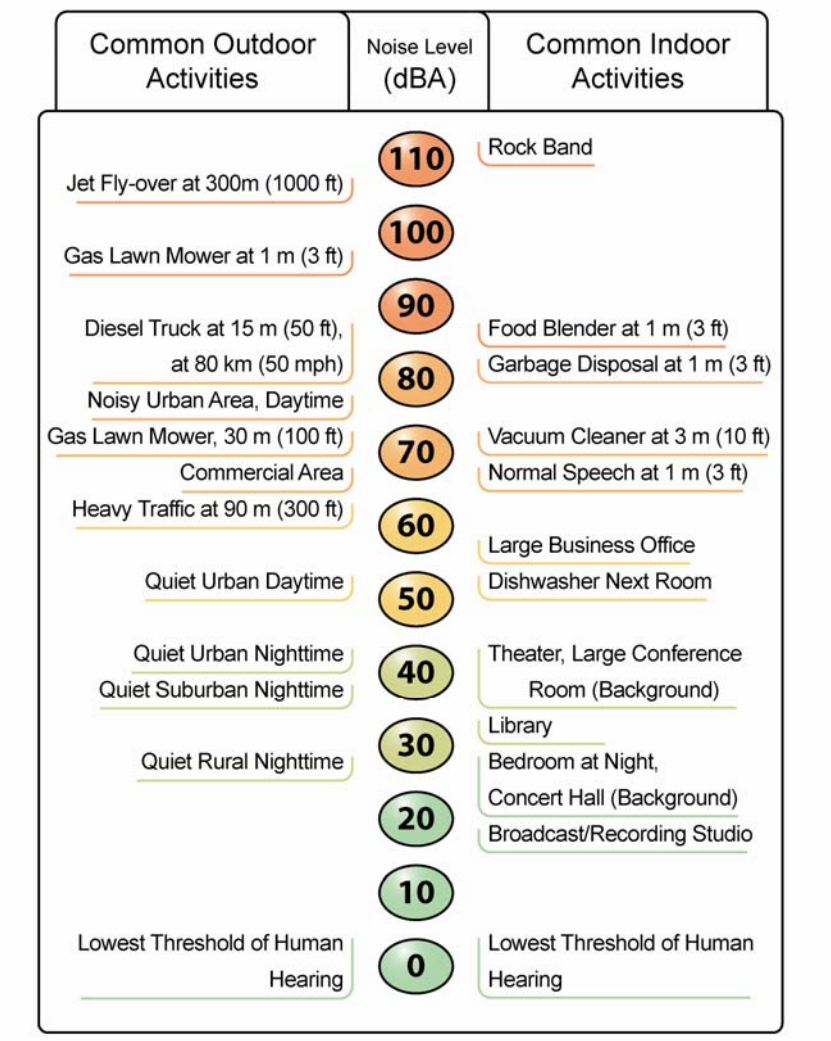
analysis. For example, the NAC for residences (67 dBA) is lower than the NAC for commercial areas (72 dBA). Table 2.4-1 lists the noise abatement criteria for use in the NEPA-23 CFR 772 analysis.

Table 2.4-1
Federal Noise Abatement Criteria

Activity Category	Noise Abatement Criteria (dBA) $L_{eq[h]}$ [1, 2]	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

[1] Noisiest hour expressed as the energy-average of the A-weighted noise level occurring during a one-hour period, or $L_{eq[h]}$.
[2] Note that criteria is applied as 'approach or exceed' the thresholds, which has been defined as 1 dBA. For Category B, the "approaching the NAC" is therefore 66 dBA, as applied in this study.

The following chart lists the noise levels of common activities to enable readers to compare the actual and predicted highway noise-levels discussed in this section with common activities.



If it is determined that the project will have noise impacts, then potential abatement measures must be considered. Noise abatement measures that are determined to be reasonable and feasible at the time of final design are incorporated into the project plans and specifications. This document discusses noise abatement measures that would likely be incorporated in the project.

The Department's *Traffic Noise Analysis Protocol* sets forth the criteria for determining when an abatement measure is reasonable and feasible. Feasibility of noise abatement is basically an engineering concern. A minimum 5 dBA reduction in the future noise level must be achieved for an abatement measure to be considered feasible. Other considerations include topography, access requirements, other noise sources and safety considerations. The reasonableness determination is basically a cost-benefit analysis. Factors used in determining whether a proposed noise abatement measure is reasonable include: residents acceptance, the absolute noise

level, build versus existing noise, environmental impacts of abatement, public and local agencies input, newly constructed development versus development pre-dating 1978 and the cost per benefited residence.

2.4.1 Affected Environment

The existing I-680/SR-4 interchange is bordered by a mixture of land uses, including homes, businesses, Buchanan Field Airport, undeveloped parcels, and highway, railroad, and local road rights-of-way. The Walnut and Grayson creek flood channels and Contra Costa Canal also cross beneath I-680 and SR-4 within the interchange area. Two previous projects have been conducted to improve I-680 within the current project limits. The first project widened I-680 to three lanes in each direction in the early 1990s. As a result of that project, a 14-foot-high soundwall was installed at a mobile home development on the northbound direction of I-680, south of the Grayson Creek channel. SR-4 has one existing barrier on the eastbound direction just west of SR-242. In 2003, construction began on the I-680 HOV Lane Project and will include installation of additional soundwalls at locations on I-680 determined to qualify for abatement that were not previously protected. The HOV Lane Project includes lengthening the existing soundwall over Grayson Creek and installing new soundwalls at locations north of the existing interchange in the Blum Road area and on the north side of I-680 approximately between its crossings of the Contra Costa Canal and the BNSF railroad.

2.4.1.1 Noise Measurements and Levels

To characterize existing noise levels within the project limits, field noise measurements were conducted at land uses that could be affected by existing and project-related noise levels. Long-term measurements were recorded over a 24-hour period at locations that are affected by I-680 or SR-4 traffic noise and that represent noise-sensitive land uses (referred to as noise-sensitive receptors or just receptors). Short-term measurements (about 10 minutes) were conducted simultaneous with the collection of traffic counts at more than 50 locations throughout the study area. These short-term measurements were also conducted at areas of frequent use (e.g., commonly at residential yards fronting the freeway where permission to monitor was granted) or at equivalent accessible locations. The noise measurements were used for the modeling and prediction of future noise levels at sensitive and representative receptor locations throughout the study area.

Noise measurement locations (Appendix A, Figures A-1 through A-13) are also used as noise modeling receivers for prediction of future noise levels. Noise measurements were taken in July 2002, and additional measurements were made in February 2003. Appendix F summarizes the measurement locations and the results of modeling for future conditions with and without the project (discussed in Sections 2.4.2 through 2.4.4).

2.4.1.2 Noise Assessment Criteria

Under FHWA regulations, noise abatement must be considered for "Type I" projects when the noise levels result in a substantial noise increase, or when the predicted noise levels approach or exceed the Noise Abatement Criteria (NAC). The NAC categories, shown in Table 2.4-1, are assigned to both exterior and interior activities. Caltrans has further defined the level of "approaching the NAC" to be 1 A-weighted decibel (dBA) below the NAC (e.g., 66 dBA is considered approaching the NAC for Category B activity levels). When levels approach or exceed the applicable NAC categories, noise abatement measures that are reasonable and feasible and that are likely to be incorporated into a project as well as impacts for which no apparent solution is available, must be identified and incorporated into the plans and specifications. A noise increase is considered substantial when the predicted noise levels with the project exceed existing levels by 12 dBA $L_{eq[h]}$[9] or more.

For noise barriers to be considered feasible, a 5-dBA reduction must be achieved, and the line of sight between a truck exhaust stack (assumed to be 3.5 meters [11.5 feet] high) and the receiver (assumed to be 1.5 meters [5 feet] above the ground) must be interrupted. The noise barrier must also conform to Caltrans design standards (Caltrans Highway Design Manual, Chapter 1100, 5th Edition). Under these guidelines, the height of the noise barrier is limited to 4.9 meters (16 feet), unless constructed within 4.5 meters (15 feet) of the traveled way, where the limit is 4.2 meters (14 feet). Severe noise impacts, defined as a worst-case level of 75 dBA $L_{eq[h]}$ or greater at Category B receivers, were measured at receivers along Bayview Street.

"Reasonableness" of noise abatement is more subjective than the determination of feasibility. This criterion includes consideration of a multitude of factors, including but not necessarily limited to the number of receivers effectively protected by the barrier; the date of development of the homes; cost of the barriers; predicted future noise levels and the difference from existing levels; and achievable noise reduction.

[9] L_{eq} is the equivalent steady state noise level in a stated period of time that would contain the same acoustic energy as the time varying noise level during the same period.

These factors are used to make a "preliminary reasonableness decision" for potential noise barriers that are identified and discussed in this report. Additional factors including environmental impacts, community concerns, and other social, economic, legal, and technological factors are subsequently considered with public input in making final decisions on potential noise barriers ultimately included in the project design and construction. The draft environmental document therefore identifies the potential noise barriers as "preliminarily reasonable" or "preliminarily not reasonable" as input to this project's public input and review process.

The adopted TNAP sets forth the procedures and criteria that are used to calculate a "reasonableness allowance" for each of the barriers identified and evaluated in the noise study performed for this project. (These procedures are presented in Section 2.8 of TNAP; the TNAP reasonableness evaluation procedures are summarized at the end of Section 2.4.1 of this document). This allowance is used as a benchmark cost to help preliminarily identify whether a barrier that may protect some homes is sufficiently effective to justify its cost of construction and maintenance. The cost to construct the barriers identified for this project was estimated based on the height and length of each proposed wall, the necessary excavation and foundation, the probable barrier type, construction access, and cost contingencies. Construction estimates and bid prices for the I-680 HOV Lane Project construction (estimated and bid in 2003) were reviewed to apply the most current and applicable cost criteria available. The estimated costs for each soundwall evaluated in this study were then compared to a calculated reasonableness allowance to determine the cost effectiveness of each barrier. In general, walls that showed estimated costs of construction that were less than or very close to the calculated reasonableness allowance were identified as preliminarily feasible. Other factors were also considered, such as the total number of residences effectively protected, the potential for severe traffic noise impacts, and the potential for noise abatement measures to result in adverse environmental impacts. Soundwalls that could protect only a limited number of homes (where at least 5 dBA traffic noise reduction could be gained) and would have barrier construction costs substantially exceeding the calculated reasonableness allowance were identified. These criteria are in accordance with the TNAP (Sections 2.9 and 3.0 of TNAP), where:

If traffic noise impacts are predicted, but the proposed noise abatement is not feasible or reasonable, noise abatement will not be recommended.

The noise impacts will not cause a significant[10] adverse environmental impact.

The final decision on the project's noise abatement measures will be made upon completion of project design and public involvement process.

2.4.2 Permanent Impacts

Modeling of future year (2030) traffic conditions predicts that noise levels will increase with the project by 1 to 3 dBA at most of the receivers in the study area (the noise modeling results are listed by receiver location in the tables in Appendix F). Many of the modeled receivers show that they already approach or exceed the FHWA NAC (66 dBA for residential or Category B areas), and in some cases the 1-to-3-dBA increase from the project results in additional locations exceeding this criterion. As discussed in Section 2.4.1.2, this is the threshold at which noise abatement measures are evaluated for effectiveness. These locations are as follows:

- Along both sides of SR-4, west of I-680, a number of residential properties between the western project limit (at the Morello Avenue on- and off-ramp connections to SR-4) and Glacier Drive exceed the NAC threshold.
- On the south side of SR-4, between Glacier Drive and Pacheco Drive, two residences exceed the threshold.
- Along I-680, from the southern project limits just north of the Buchanan Field Golf Course to Grayson Creek, homes in the Concord Cascade and Rancho Diablo mobile home parks are currently protected by an existing soundwall on the northbound side of I-680. A portion of that wall south of Grayson Creek will have to be removed and replaced due to the addition of the northbound I-680 to westbound SR-4 ramp connection. This area was modeled as if a soundwall were not present, to accurately evaluate the effectiveness and design of a replacement wall with the I-680 northbound to SR-4 westbound interchange ramp in place. The modeled noise levels for receptors identified as "S-E" in the southeast quadrant of the interchange represent a worst-case condition with no existing protection, and show levels that exceed the applicable NAC threshold.

[10] The reference to "significant" is applied here consistent with the procedures, criteria, and terminology contained in TNAP and does not apply with regard to NEPA.

2.4.3 Construction and Temporary Impacts

Construction is anticipated to occur over several years for each phase of the interchange reconstruction. In addition, the phases may not be constructed sequentially, depending on funding. The majority of project construction would occur at the interchange area. With the exception of the interchange area, roadway construction activities would not typically remain in one location for long periods. Noise-sensitive receivers in the immediate interchange vicinity could be subject to construction-generated noise for extended periods.

Roadway, retaining wall, and soundwall construction on the outside portions of the highways would likely result in the highest noise levels. Near the source (measured at 15 meters [49 feet]), noise levels range from approximately 80 to 90 dBA for equipment such as scrapers, bulldozers, trucks, backhoes, pneumatic tools, and pumps. Pile drivers, if necessary, create the highest noise levels (95 to 105 dBA). The clearing of vegetation prior to construction can also result in high noise levels. Construction activities that occur along the median (e.g., the addition of new inside lanes) results in lower construction noise impacts since this noise is farther away and masked by traffic noise.

Residential land uses in the south leg of the interchange area and nearest the interchange immediately adjacent to portions of the project would be most affected by construction noise. Residential receivers near Blum Road would also be affected by construction noise. These activities would be temporary, and mitigation is proposed to minimize the potential impacts.

2.4.4 Mitigation

Noise levels on I-680 and SR-4 with a range of barriers in place are listed in Tables 2.4-2 (Phases 1 and 2) and 2.4-3 (Phases 3 through 5). Tables 2.4-2 and 2.4-3 also summarize the evaluation of barriers in regard to noise reduction and their effectiveness in terms of homes protected. For each of the soundwalls, a "reasonableness allowance" has been calculated that considers the future noise level, the noise level increase caused by the project (e.g., most are within a 1 to 3 dBA increase), and the age of the dwelling units protected. The calculated reasonableness allowance provides an indication of an amount that, under the FHWA and Caltrans criteria, is a reasonable expenditure of funding to protect existing dwellings impacted by highway noise. The cost of constructing a barrier has been estimated and compared to the calculated allowance. Barriers with estimated costs falling within or

Table 2.4-2
Phase 1 and 2 Soundwalls Preliminarily Evaluated as Feasible and Reasonable

Soundwall (Project Phase)	Alternative	Description	Length	Predicted Noise Reduction	Number of Benefited Receivers or Residences	Reasonable Allowance Per Residence ($000s)	Total Reasonable Allowance ($000s)	Estimated Cost of Soundwalls $000s (1)	Preliminary Recommendation(2)
SW1A (Phase 1)	2.4m	Along EOS of NB I680 Sta. 101+20 (conform to existing) to 102+80 on NB I680 to WB SR4 Connector. [1]	~800 m	5 dBA	35	$ 39	$ 1,365	$ 710	--
	3.0m			6 dBA	40	$ 41	$ 1,640	$ 777	--
	3.6m			8 dBA	65	$ 41	$ 2,665	$ 1,040	--
	4.2m			9 dBA	70	$ 43	$ 3,010	$ 1,107	R
SW1B Option 1 (Phase 1)	3.0m	Along EOS of NB I680 to WB SR4 Conn. From Sta. 102+80 (conform to SW1A) to 104+80 on NB I680 + From NB I680 Sta. 109+00 to Sta 111+00. [1]	Total ~400m	5 dBA	5	$ 33	$ 165	$ 251	--
	3.6m			6 dBA	10	$ 35	$ 350	$ 301	--
	4.2m			6 dBA	15	$ 35	$ 525	$ 351	R
SW1B Option 2 (Phase 1)	2.4m	Along ROW extending about 190m northeast from Sta 102+80 of NB I680 to WB SR4 Conn. [1]	~190m	5 dBA	5	$ 33	$ 165	$ 100	NR
	3.0m			7 dBA	10	$ 35	$ 350	$ 122	
	3.6m			8 dBA	15	$ 35	$ 525	$ 145	
	4.2m			9 dBA	15	$ 37	$ 555	$ 176	
	4.8m			10 dBA	20	$ 37	$ 740	$ 199	
SW5 (Phase 2)	3.6m	Along EOS of EB SR4 Sta. 89+45 (on Morello On Ramp) to 95+30 plus along ROW from Sta 95+10 along ROW to 97+20 (includes overlap).	~800m	5 dBA	5	$ 29	$ 145	$ 1,040	--
	4.2m			6 dBA	17	$ 31	$ 527	$ 1,107	--
	4.8m			7 dBA	26	$ 31	$ 806	$ 1,175	R
SW6 (Phase 1)	4.2m	Along EOS of WB SR4 from Sta. 91+00 to 97+20.	~620m	5 dBA	5	$ 19	$ 95	$ 858	NR

LS = Line of sight not interrupted for many receivers.

(1) Note that the northern extent of these wall options at Grayson Creek coincide with a wall included for construction as part of the I-680 HOV lanes project. The need for the Grayson Creek wall extension on the I-680 HOV lane project should be verified if Phase 1 of this I-680/SR 4 interchange project proceeds with funding, design, and construction.

(2) R = Recommended for construction at this height. NR = Evaluated but not recommended.

Table 2.4-3
Phases 3 through 5 Soundwalls Preliminarily Evaluated as Feasible and Reasonable

Soundwall (Project Phase)	Alternative	Description	Length	Predicted Noise Reduction	Number of Benefited Receivers or Residences	Reasonable Allowance Per Residence ($000s)	Total Reasonable Allowance ($000s)	Estimated Cost of Soundwall ($000s)	Preliminary Recommendaton (1, 2)
SW2 (Phase 4)	2.4m	Along EOS of SB I680 Sta. 118+20 to 120+10. 1	~190m	6 dBA	10	$ 33	$ 330	$ 91	--
	3.0m			7 dBA	15	$ 33	$ 495	$ 113	--
	3.6m			8 dBA	15	$ 33	$ 495	$ 136	--
	4.2m			9 dBA	15	$ 35	$ 525	$ 159	R
SW3 (Phase 5)	1.8m	Along EOS of NB I680 Sta. 119+30 to 122+60 (could transition into hillside at north end). 1	~330m	5 dBA	2	$ 31	$ 62	$ 283	--
	2.4m			6 dBA	5	$ 33	$ 165	$ 312	--
	3.0m			7 dBA	15	$ 33	$ 495	$ 342	--
	3.6m			8 dBA	20	$ 33	$ 660	$ 455	--
	4.2m			9 dBA	20	$ 35	$ 700	$ 485	R
SW4A (Phase 4)	3.6m	Along EOS of SB I680 Sta. 124+00 to 126+70 then transition to ROW at 127+00. 2	~320m	6 dBA	3	$ 31	$ 93	$ 416	NR
	4.2m			7 dBA	4	$ 31	$ 124	$ 443	
SW4B (Phase 4)	3.6m	Along EOS of SB I680 Sta. 126+00 to 126+70 then transition to ROW at 127+00 and along ROW to 129+20 (overlapping SW4A). 2	~340m	6 dBA	3	$ 31	$ 93	$ 464	NR
	4.2m			6 dBA	3	$ 31	$ 93	$ 484	
SW4(A+B) (Phase 4)	3.6m	Along EOS of SB I680 Sta. 124+00 to 126+70 then transition to ROW at 127+00 and along ROW to 129+20 (overlapping SW4A). 2	~540m	6 dBA	6	$ 31	$ 186	$ 737	NR
	4.2m			6 dBA	7	$ 31	$ 217	$ 784	

1 - Estimated costs versus effectiveness should be re-evaluated/updated at the time Phases 3 through 5 are advanced for funding and further design work

2 - Recommended for construction (R) at this height. NR is evaluated but not recommended

Table 2.4-3
Phases 3 through 5 Soundwalls Preliminarily Evaluated as Feasible and Reasonable

Soundwall (Project Phase)	Alternative	Description	Length	Predicted Noise Reduction	Number of Benefited Receivers or Residences	Reasonable Allowance Per Residence ($000s)	Total Reasonable Allowance ($000s)	Estimated Cost of Soundwall ($000s)	Preliminary Recommendaton (1, 2)
SW7 Option 1A (Phase 4)	3.0m	Along EOS of SBI680 to EB SR4 Conn. From Sta. 110+80 to 107+70.	~310m	5 dBA	2	$ 33	$ 66	$ 314	NR
	3.6m			6 dBA	5	$ 35	$ 175	$ 416	
	4.2m			7 dBA	8	$ 35	$ 280	$ 442	
SW7 Option 1B (Phase 5)	3.0m	Along EOS of SBI680 to EB SR4 Conn. From Sta. 110+80 to 107+70 PLUS Along EOS of EB SR4 from Sta. 118+30 to 120+40.	~520m	6 dBA	3	$ 35	$ 105	$ 569	--
	3.6m			7 dBA	10	$ 35	$ 350	$ 757	--
	4.2m			8 dBA	22	$ 35	$ 770	$ 806	R
SW7 Option 2 (Phase 4)	4.2m	Along ROW of EB SR4 from Sta. 110+10 of SBI680 to EB SR4 Conn. to Sta. 108+00 (along Mobile Home Park boundary).	~220m	5 dBA	4	$ 33	$ 132	$ 224	NR
	4.8m			6 dBA	10	$ 35	$ 350	$ 253	
SW8 (Phase 4)	3.6m	Along EOS of EB SR4 Sta. 136+00 (along On Ramp) to 139+40.	~340m	5 dBA	15	$ 29	$ 435	$ 364	--
	4.2m			5 dBA	20	$ 29	$ 580	$ 405	R
SW9 (Phase 4)	3.6m	Along EOS of EB SR4 to SB SR242 Conn. From Sta. 144+00 (connect to ex. SW) extending to Project limits or ex. SW on SR242.	~230m	5 dBA	6	$ 31	$ 186	$ 299	NR (3)
	4.2m			6 dBA	20	$ 33	$ 660	$ 318	
SW10 (Phase 3)	3.6m	Along ROW of EB SR4 from Sta. 150+00 to EB Sta. 152+80	~280m	6dBA	3	$ 31	$ 93	$ 400	--
	4.2m			8 dBA	6	$ 33	$ 198	$ 426	--
	4.8m			9 dBA	6	$ 35	$ 210	$ 452	R
SW11 (Phase 3)	2.4m	Along ROW of EB SR4 from Sta. 153+40 to EB Sta. 157+00	~360m	5 dBA	9	$ 33	$ 297	$ 351	--
	3.0m			7 dBA	10	$ 35	$ 350	$ 385	--
	3.6m			8 dBA	11	$ 35	$ 385	$ 515	--
	4.2m			10 dBA	11	$ 37	$ 407	$ 548	--
	4.8m			11 dBA	11	$ 37	$ 407	$ 581	R

2 - A wall is included in the I-680 HOV lane project at this same location. This study recommends a similar wall at this same area, but extended further north and with two options (4a and 4b). These walls should be built to accommodate Phase 5 of the interchange project.

3 - SW9 is not recommended because it does not meet minimum sight distance requirements at its necessary location

very close to the estimated allowance were considered for construction as part of the project. The following summarizes the results of the barrier analysis. Locations of the soundwalls evaluated are shown in Appendix A, Figures A-1 through A-13.

2.4.4.1 Soundwalls Studied Within Phases 1 and 2 Construction Limits

The following soundwalls were studied and identified as feasible to construct, and are relatively cost-effective in terms of construction and maintenance costs. Caltrans intends to incorporate noise abatement measures in the form of soundwalls at the locations and heights summarized below. Calculations based on preliminary design data indicate that the soundwalls will reduce noise levels by 5 or more dBA at estimated costs listed in Table 2.4-2. If, during final design, conditions substantially change, soundwalls might not be provided. The final decision regarding soundwalls will be made upon completion of the project design and public involvement processes.

- **Soundwall SW1A** will be needed at the mobile home park on I-680 to replace the existing barrier that will be impacted by Phase 1 construction. The existing wall at this location (between approximately Center Avenue and Grayson Creek) was originally constructed when I-680 was widened to three through-travel lanes in each direction. In 2003–2004, the wall will be extended north across the Grayson Creek bridge as part of the construction of the I-680 HOV Lane Project. This wall will be unavoidably impacted by the proposed Phase 1 northbound I-680 to westbound SR-4 ramp, which also requires acquisition and relocation of some homes just south of the creek. **SW1A is identified as preliminarily feasible and reasonable** to replace the wall along the impacted portions of the freeway and extend it along the proposed ramp.
- **SW1B** extends this soundwall north along or across Grayson Creek. Two options are possible for SW1B at the Grayson Creek crossing. **SW1B Option 1** would provide a wall segment on the I-680 Grayson Creek bridge and a wall on the northbound I-680 to westbound ramp as it rises over Grayson Creek (see Appendix A, Figures A-10 and A-11). The height of the Option 1 wall would be verified during final design if it is the selected as the preferred option. SW1B Option 1 would provide up to 5 to 6 dBA of traffic noise reduction at 15 homes. This wall would be constructed during Phase 1 but would be located to accommodate the potential relocation of the northbound I-680 to eastbound SR-4 connector ramp that is planned as part of Phase 5. **SW1B Option 2** would locate

the required wall along the Grayson Creek banks within a narrow strip of State-owned right-of-way, which lies along the east side of the creek channel adjacent to the existing mobile home development. SW1B would provide 5 to 10 dBA noise reduction at up to 20 homes. SW1B Option 2 provides greater noise reduction at the mobile home park because the wall is closely adjacent to the existing mobile homes and more effectively shields them from highway noise. However, this wall location also blocks access and views from the mobile home park to the creek channel area (see Section 2.17) and crosses a large sewer/utility line. Because SW1B Option 2 adversely affects these existing views at Grayson Creek, soundwall **SW1B Option 1 is identified as preliminarily feasible and reasonable**. The Option 1 walls would be located along the freeway right-of-way and on the edge of the northbound I-680 to eastbound SR-4 flyover ramp.

- **Soundwall SW5** would be constructed along the eastbound direction of SR-4 (the south side of SR-4) between the Morello Avenue interchange to just north of Deerwood Drive. SW-5 would actually consist of two separate but overlapping walls: the westernmost half of the wall would be built along the edge of the freeway shoulder, while the easternmost half would be constructed along the edge of the right-of-way. The soundwall would be divided to account for the changes in topography, to ensure that the wall is placed where it most effectively intercepts the line-of-sight between traffic and the residences adjoining the freeway. A 16-foot-high barrier on the right-of-way line combined with a 14-foot-high wall at the shoulder would benefit 26 homes (providing at least a 5-dBA or more reduction in traffic noise). SW-5 was also extended west of the rest of the project's "construction limits" to benefit several more residences near Morello Avenue. **SW5 with its overlapping wall design is identified as the most effective, located from approximately Morello Avenue to north of Deerwood Drive.** This overlapping wall design protects a relatively high number of homes that are predicted to otherwise gain at least 5 dBA from freeway traffic noise.

2.4.4.2 Soundwalls Studied Within Phases 3, 4, and 5 Construction Limits

The following soundwalls were identified as feasible to construct and cost-effective in terms of construction and maintenance costs. These soundwalls should be verified at the time these phases advance for further consideration:

- **Soundwalls SW2 and SW3** would replace existing walls along both the northbound and southbound sides of I-680 over the Blum Road overpass area. The new interchange (Phases 4 and 5) expands the freeway connector ramps to potentially require removal and reconstruction of some or all of both of the existing walls to be built in this location in 2003–2004 as part of the I-680 HOV Lane Project. The south and north limits of walls SW2 and SW3 are approximately the same as for the I-680 HOV project walls. Both walls show an estimated cost below the reasonableness allowance. **These walls, identified as preliminarily feasible and reasonable, should be retained or, if impacted by construction, replaced**. It is possible that the existing walls could be partially compatible with the final design of Phases 4 and 5; therefore, at the time these phases are advanced for further consideration, the alignment of the ramps and freeway widening necessary to accommodate Phases 4 and 5 should be reviewed to determine if it can conform with the existing structures to minimize their replacement or reconstruction.
- **Soundwall SW7** would be located just east of the interchange to protect the mobile home park on Grayson Creek that faces SR-4. Three soundwall options were identified and evaluated in this area. **Option SW7-1A**, by itself would benefit the fewest residences, placing a soundwall along the edge of shoulder of the southbound I-680 to eastbound SR-4 connector. A 14-foot-high barrier would benefit up to eight residences. **Option SW7-1B** is a combination of two walls. It would include the Option 1A soundwall and an additional edge-of-shoulder soundwall (SW7-1B) along a portion of the northbound I-680 to eastbound SR-4 connector (where it connects to SR-4). At a height of 14 feet, these two walls would protect a total of 22 residences. Option SW7-1B effectively protects more residences (achieving at least a 5 dBA reduction in traffic noise). **Option 2** places a wall along the right-of-way at the northernmost edge of the mobile home property facing SR-4. A 16-foot-high wall would protect an estimated 10 homes, at a cost that is less than the estimated reasonable allowance. However, the wall at this location (SW7 Option B) is adjacent to homes and will block views. **Because the two walls included in Option SW7-1B protect the most residences at a reasonable cost, they are identified as preliminarily feasible and reasonable for Phases 3 through 5 when these phases are advanced for further consideration**.
- **Soundwall SW8** would protect the mobile home park on SR-4 at Peralta Road, just east of Solano Way. A 14-foot-high wall along the edge of shoulder would

provide at least 5 dBA reduction at 15 to 20 residences, is well within the calculated reasonable allowance. **SW8 is considered preliminarily feasible and reasonable to include in Phase 4 when that phase is advanced for further consideration.**

- **Soundwall SW10** was evaluated as part of the median widening for Phase 3 near the eastern extent of the project limits along the eastbound SR-4 right-of-way. It was evaluated connecting to the existing barrier and extending eastward to end where the terrain at the right-of-way decreases relative to the adjacent homes to a point where the barrier's effectiveness was determined to be less than 5 dBA. It would effectively protect (a 5 dBA reduction or more) 3 to 6 residences. The estimated cost to construct and install this barrier was estimated to be approximately two to four times the calculated reasonableness allowance. A previous noise study performed for the widening of SR-242 reached the same conclusion regarding number of homes protected and the noise levels with and without a soundwall. However, the area potentially protected by SW11 is nearby and similar, and the "gap" between SW10 and SW11 is due to a change in topography and short distance between homes along SR-242 and SR-4. Residents have raised concerns about freeway noise in this area. Although this wall was rejected in the past because its estimated costs fell below the calculated reasonableness budget, **SW10 should be preliminarily considered for construction with Phase 3 of the interchange project**. The costs are not substantially below the reasonableness budget, and complaints about not obtaining noise protection with previous freeway highway improvement projects for SR-242 and SR-4 have been received for many years.
- **Soundwall SW11** was evaluated along SR-4, just east of the SW10 location at the eastern extent of the Phase 3 widening. SW11 would extend along the freeway protecting some of the backyards and homes on Bayview Circle. The terrain in this area rises above the freeway traveling to the east, but there are some residences that although located above the freeway could benefit from a barrier along the right-of-way. Up to 11 residences could achieve a noise reduction of 5 to 11 dBA. This barrier would have to step up in height relative to the ground surface at each end because of hill-like terrain in order to maintain a constant barrier top height with respect to the residential properties. The cost estimate for this barrier exceeds the calculated preliminary reasonableness allowance for the wall. However, noise levels were modeled at two residences at 75 dBA for the existing worst-case period, and are predicted to reach levels of 76 and 77 dBA at

several homes (all on Bayview Circle, with backyards facing SR-4). Noise levels of 75 dBA or greater can be considered for unusual or extraordinary noise abatement strategies, where normal abatement measures are not feasible or reasonable. Residents have expressed concerns and comments about the noise levels in this area, and previous evaluations (for the SR-242 project) estimated relatively high costs for construction of the walls and whether they could be effective if placed within the State right-of-way boundaries. Given the concerns raised by local residents and the modeled noise levels exceeding the 75 dBA for consideration of unusual or extraordinary abatement measures, **this wall should be considered when Phase 3 advances for funding and design**. Because of the hilly terrain at SW10 and SW11, current, more detailed or up to date topographical information should be used to verify that SW10 and SW11 can achieve a line-of-sight barrier between homes considered in this study and the freeway.

2.4.4.3 Soundwalls Studied and Preliminarily Found Not Feasible or Reasonable Within Phases 1 and 2 Construction Limits

Within Phases 1 and 2, freeway noise levels were studied and predicted to exceed the threshold for consideration of a noise barrier along SR-4. However, evaluation of the effectiveness of the modeled barrier determined it would not protect enough residences to be considered cost-effective, as described below.

- **Soundwall SW6** was evaluated on the edge of the right-of-way on SR-4 in the westbound direction, from approximately the Morello Avenue off-ramp to the eastern extent of residential development in that area, roughly corresponding with Holiday Hills Drive. Some existing private development walls and fences protect some of the residences along SR-4, but there are no existing soundwalls within the State right-of-way in this area. **SW6** at 14 feet high on the edge of the right-of-way would benefit only seven residences. The evaluation of this wall showed effective noise reduction at those homes, but the length and the total cost of the wall is relatively high with respect to the total number of homes effectively protected. The sound reduction effectiveness of this wall is diminished because of the distance of the freeway from the homes along Arnold Drive. (Soundwalls are generally most effective where homes are adjacent to the freeway or road producing the traffic noise, and become less effective with greater separation between the homes and the freeway or road where the traffic noise is generated.) The presence of existing barriers and fences also diminishes the effectiveness of a

wall placed along the freeway. As noted in Section 2.4.1.2, a "reasonableness evaluation" is required under adopted guidelines that considers, among many criteria, the number of homes effectively protected, the date the protected homes were constructed, the predicted noise levels, and the reduction gained from the most effective barriers evaluated. A soundwall located at SW6 would have estimated costs that well exceed the calculated reasonableness allowance, which shows that the length and size of the wall can not effectively protect enough homes to reasonably justify the cost of construction and maintenance, per established criteria and guidelines for this evaluation. The overall reduction gained (in terms of number of homes that would achieve a 5 dBA or more lowering in noise levels) was determined to not be an effective investment when considering the total cost of the wall. **SW6 has been preliminarily determined to not be cost-effective or reasonable**.

2.4.4.4 Soundwalls Studied and Preliminarily Found Not Reasonable or Feasible Within Phases 3, 4, and 5 Construction Limits

Similar to Phases 1 and 2, several barriers were studied and preliminarily found to not be reasonable or feasible within Phases 3 through 5, as the number of homes that could achieve an efficient level of noise reduction was not considered cost-effective when compared to the total cost of the wall:

- **Soundwalls SW4A and SW4B** were evaluated at the north end of the project, north and south of where the BNSF railroad crosses I-680, are areas of low-density or scattered residences on the west side of the freeway. One soundwall already exists in this area as a result of the I-680 HOV Lane Project. Soundwalls SW4A and 4B, are two separate walls that overlap on the southbound direction of I-680 north of the Contra Costa Canal and south of the BNSF railroad, and were evaluated as part of Phase 4 in this area. Both walls SW4A and 4B show estimated construction costs well above the calculated reasonable allowance for cost-effective noise abatement**. Therefore, no additional soundwalls are preliminarily identified as feasible and reasonable for future phases of the project within this area.**
- **Soundwall SW9** was evaluated along the connector ramp from eastbound SR-4 to southbound SR-242. A wall along the edge of the shoulder would benefit 6 to 20 residences in the Northwood Condominium complex. However, this wall would not comply with established sight distance requirements. It would have to be installed along the edge of the eastbound SR-4 to southbound SR-242 ramp

connection, shown in Figure A-7 of Appendix A. With this wall in place, drivers would have insufficient sight distance at the design speed for this ramp to meet minimum freeway design requirements. Therefore, the wall would introduce a potential safety issue for drivers, and cannot be installed. **Soundwall SW9 therefore has been preliminarily determined to not be feasible and is removed from further consideration.** This soundwall was also identified and evaluated for a previous widening project on SR-242 and the same determination was reached.

2.4.4.5 Construction Mitigation

The following measures should be implemented during project construction through requirements set for the construction contractors. The proposed measures should adequately mitigate the noise impacts at adjacent residences.

- Equip all internal combustion engine–driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
- Strictly prohibit unnecessary idling of internal combustion engines within 100 feet of residences.
- Avoid staging construction equipment within 200 feet of residences and locate all stationary noise-generating construction equipment, such as air compressors and portable power generators, as far as practical from noise-sensitive residences.
- Construction equipment should be required to conform to the provisions in Section 7-1.01I, Sound Control Requirements, of the latest Standard Specifications. These requirements are meant to minimize the impact from construction noise yet in no way relieve the contractor from complying with local noise ordinances.

2.5 Energy

The proposed project is designed to provide direct connections between the heaviest traveled movements at the I-680/SR-4 interchange. By improving points of congestion at the interchange, such as eliminating the short weaving areas and providing higher-capacity ramps between the most heavily used I-680 and SR-4 connections, constrained traffic will flow more efficiently between these highways. As discussed in Section 1.2, by eliminating existing traffic bottlenecks, the proposed project would increase highway mainline volumes that will be able to flow through

this point of congestion. To address the effects to transportation energy use, a simple comparison of travel characteristics and associated vehicular energy use was made to compare the proposed project phases with the No Project future conditions.

2.5.1 Affected Environment and Impacts

Energy or fuel use is directly related to the amount of miles traveled and speed or fuel efficiency of the average vehicles using the highways. The traffic analysis performed for this project evaluated changes in traffic volumes and speeds on the mainline freeways and connecting ramps for all project phases and the No Project conditions. That evaluation is based on local land use planning projected to the year 2030, and traffic modeling of the changes using a model that is consistent with regional traffic modeling by the MTC. The land use assumptions were the same for the project and No Project alternatives (i.e., the model does not forecast growth differently between alternatives, only the regional local routes that drivers will use). The traffic model provides total vehicle miles traveled for the No Project and proposed improvements within the limits of the project area. In the year 2030, a total of 1,510,980 vehicle miles traveled is projected for the No Project condition. Phases 1 and 2 are projected to have 1,521,870 vehicle miles traveled, an increase of 0.72 percent. With all five phases of the interchange completed, vehicle miles traveled through the interchange area are predicted at 1,537,970, or about 1.8 percent greater than with the No Project alternative. This is considered a minor increase and not a substantial impact. In addition, fuel efficiency improves with vehicle speeds, up to about 60 miles per hour. The project will improve average vehicle speeds through the interchange area because it will provide a relatively higher-speed direct connection between the two highways and eliminate some of the points of greatest congestion where cars are averaging relatively slow speeds, such as at the least fuel-efficient merging and weaving sections discussed earlier.

2.5.2 Mitigation

The small increase in energy use due to the higher number of vehicles able to drive through the less-congested interchange would be at least partially offset by the more efficient traffic operations achieved by the interchange. Mitigation for energy use is not practicable to apply to a specific project other than improving traffic operations, which this project would already help to achieve.

2.6 Wetlands and Other Waters of the United States

The wetland studies were performed for all five phases of the I-680/SR-4 interchange improvements. This section discusses the location of wetlands within the vicinity of all five phases. A Wetland Delineation Report details the wetland surveys performed for the project and is available under separate cover.

Regulatory Setting

Wetlands and other waters are protected under a number of laws and regulations. At the federal level, the Clean Water Act (33 USC 1344) is the primary law regulating wetlands and waters. The Clean Water Act regulates the discharge of dredged or fill material into waters of the United States, including wetlands. Waters of the United States include navigable waters, interstate waters, territorial seas and other waters that may be used in interstate or foreign commerce. To classify wetlands for the purposes of the Clean Water Act, a three-parameter approach is used that includes the presence of hydrophytic (water-loving) vegetation, wetland hydrology, and hydric soils (soils subject to saturation/inundation). All three parameters must be present, under normal circumstances, for an area to be designated as a jurisdictional wetland under the Clean Water Act.

Section 404 of the Clean Water Act establishes a regulatory program that provides that no discharge of dredged or fill material can be permitted if a practicable alternative exists that is less damaging to the aquatic environment or if the nation's waters would be significantly degraded. The Section 404 permit program is run by the U.S. Army Corps of Engineers (USACE) with oversight by the Environmental Protection Agency (USEPA).

The Executive Order for the Protection of Wetlands (E.O. 11990) also regulates the activities of federal agencies with regard to wetlands. Essentially, this executive order states that a federal agency, such as the Federal Highway Administration, cannot undertake or provide assistance for new construction located in wetlands unless the head of the agency finds: 1) that there is no practicable alternative to the construction and 2) the proposed project includes all practicable measures to minimize harm.

At the state level, wetlands and waters are regulated primarily by the Department of Fish and Game (CDFG) and the Regional Water Quality Control Boards (RWQCB). In certain circumstances, the Coastal Commission (or Bay Conservation and Development Commission) may also be involved. Sections 1600–1607 of the Fish

and Game Code require any agency that proposes a project that will substantially divert or obstruct the natural flow of or substantially change the bed or bank of a river, stream, or lake to notify CDFG before beginning construction. If CDFG determines that the project may substantially and adversely affect fish or wildlife resources, a Lake or Streambed Alteration Agreement will be required. CDFG jurisdictional limits are usually defined by the tops of the stream or lake banks, or the outer edge of riparian vegetation, whichever is wider. Wetlands under jurisdiction of the USACE may or may not be included in the area covered by a Streambed Alteration Agreement obtained from the CDFG.

The Regional Water Quality Control Boards were established under the Porter-Cologne Water Quality Control Act to oversee water quality. The RWQCB also issues water quality certifications in compliance with Section 401 of the Clean Water Act. Please see the Water Quality section for additional details.

2.6.1 Affected Environment

2.6.1.1 Methods

The wetland delineation study area, the area in which wetlands were surveyed and mapped ("delineated"), includes areas of existing and proposed right-of-way and estimated construction areas that could be affected by the project. The areas of jurisdictional wetlands (using the definition of 33 CFR 328.3(b)) and waters of the United States that are crossed by I-680 or SR-4 or are near the freeways for all five phases of the project are shown on Figure 2.6-1.

Potential jurisdictional wetlands and waters of the United States were delineated on April 18, 2002, using the routine on-site method described in the 1987 USACE Wetland Delineation Manual (Environmental Laboratory 1987). In the absence of human disturbance or unusual circumstances, an area must possess indicators (characteristics) of three parameters to be considered a jurisdictional wetland: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. This method was used to delineate wetlands and other waters of the United States in the project study area.

Jurisdictional wetlands and other waters of the United States were identified within the project area in the following locations (Figure 2.6-1):

- Where the northbound I-680 to westbound SR-4 ramp and the eastbound SR-4 to southbound I-680 ramp cross over Grayson Creek

- Where SR-4 crosses over Walnut Creek
- Along the northern segment of I-680 (near Blum Road and Imhoff Drive)
- In the vicinity of the BNSF railroad

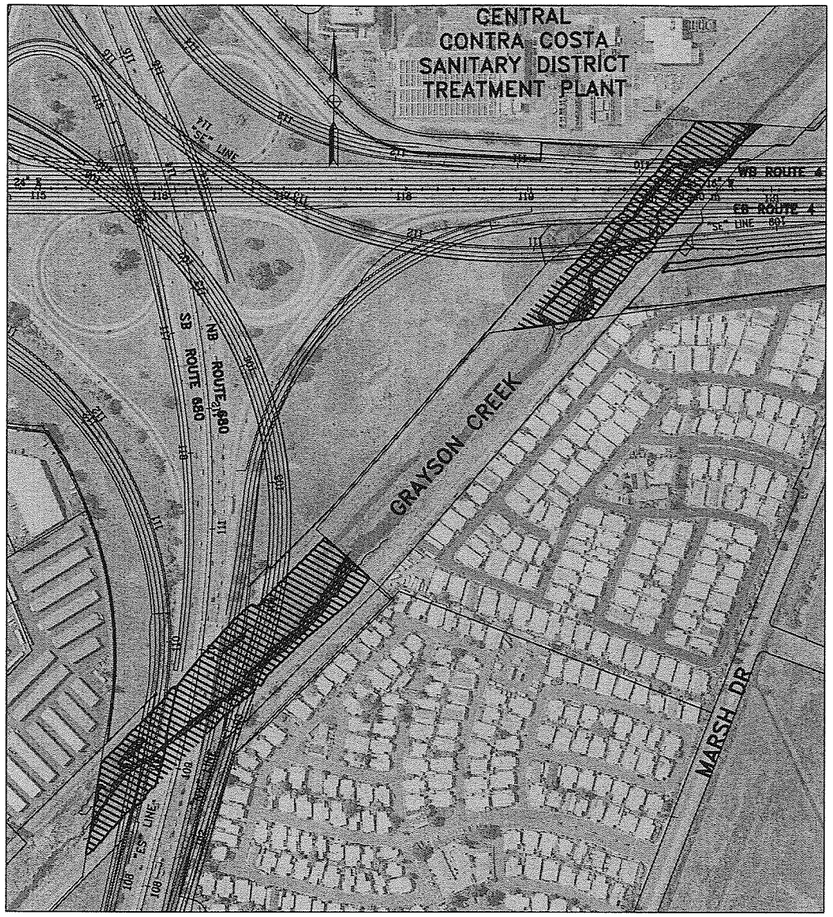
The Grayson Creek Flood Control Channel and Walnut Creek include freshwater wetlands and waters of the United States. In the project area, both creeks are contained within earthen, trapezoidal flood-control channels. The low-flow portions of the channels contain water all year. Soils are Omni clay loams, deposited by runoff in the creeks. Vegetation in the Grayson Creek channel consists of annual and perennial species including flatsedge (*Cyperus rotundus*), cattails (*Typha latifolia*), rabbitsfoot grass (*Polypogon monspeliensis*), saltgrass (*Distichlis spicata*), and prickly lettuce (*Lactuca serriola*). The majority of this disturbed vegetation is hydrophytic. Vegetation in Walnut Creek where it is crossed by SR-4 includes cattails, hardstem bulrush (*Scirpus acutus*), saltgrass, Himalayan blackberry (*Rubus discolor*), and common horsetail (*Equisetum arvense*).

The flood control channel near Blum Road and Imhoff Drive has concrete retaining walls, while the channel itself is unlined. Vegetation present includes cattails, hardstem bulrush, eucalyptus (*Eucalyptus* sp.), and willow (*Salix* sp.). The wetland near the BNSF railroad is a freshwater marsh hydrologically connected to Pacheco Creek. The majority of this marsh is outside of the project area, and only a small area is near the northernmost extent of northbound I-680 where construction would begin. This wetland is dominated by cattails and bulrush.

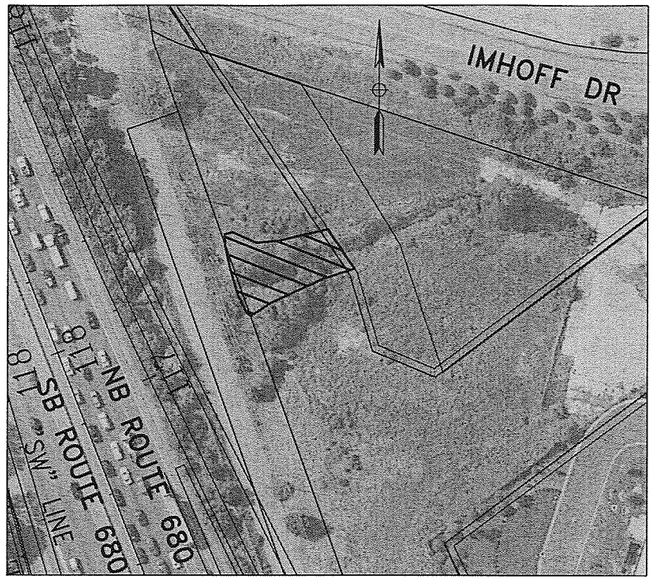
2.6.1.2 Non-Jurisdictional Areas

Two sites were evaluated and determined to be non-jurisdictional.

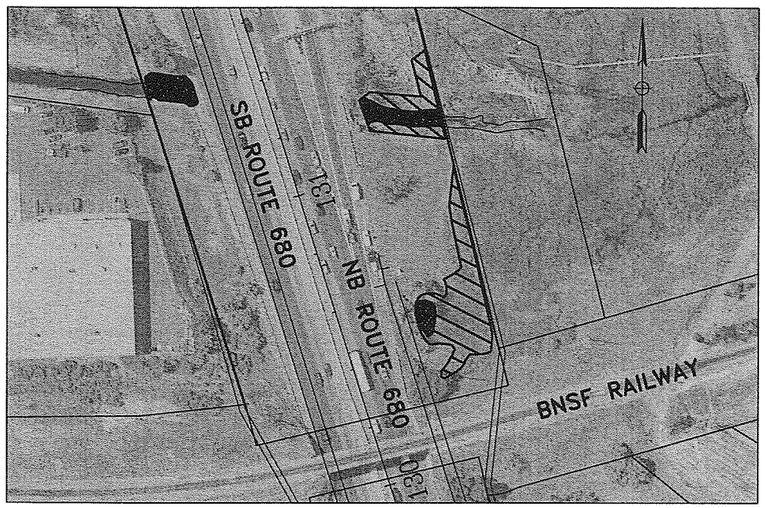
The Contra Costa Canal crosses SR-4 just north of Contra Costa Canal Road. The canal is a concrete-lined channel that originates in Knightson, California, near Bethel Island, where it takes water from the Sacramento River and drains it into the Martinez Reservoir, west of the project area. This reservoir is not considered to be a jurisdictional water of the United States. Diversions of waters of the United States that are not discharged back into waters of the United States may not be considered jurisdictional; however, this would require USACE verification. The Contra Costa Canal is not considered jurisdictional for this project. A drainage ditch excavated in upland soils is located behind the California Highway Patrol headquarters, north of SR-4 and west of I-680. This ditch is not considered to be jurisdictional because it catches runoff and does not divert a stream.



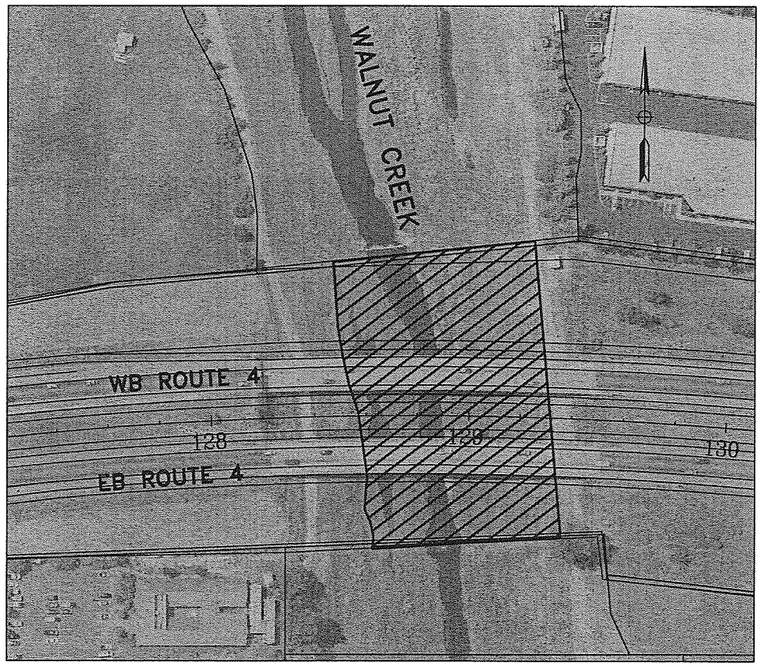
ALONG GRAYSON CREEK
FIGURE 1



NEAR IMHOFF DRIVE
FIGURE 2



CHANNEL NORTH OF
BNSF RAILWAY–FIGURE 3



ALONG WALNUT CREEK
FIGURE 4

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	CC	680	32.0–36.5		
04	CC	004	16.6–23.6		

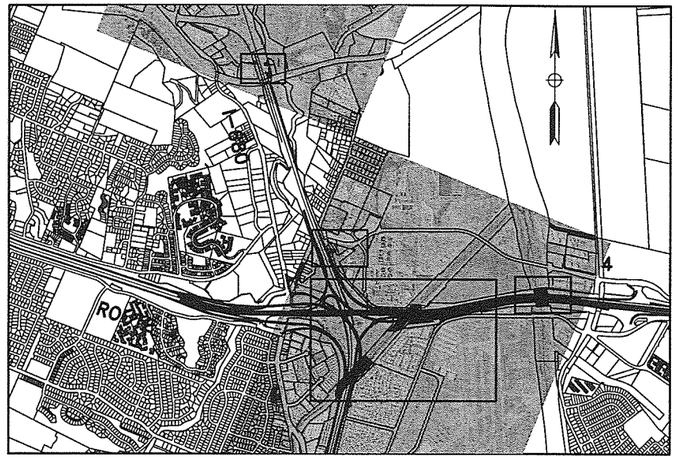
REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

URS
500 12TH Street, Suite 200
Oakland, CA 94607-4014



KEY MAP

LEGEND:

WETLANDS

OTHER WATERS OF THE UNITED STATES

WETLANDS AND OTHER WATERS OF THE U.S. CROSSED OR IN VICINITY OF PHASES 1–5

FIGURE 2.6–1

FOR REDUCED PLANS ORIGINAL 0 20 40 60 80

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2.6.1.3 Consultation

The wetland delineation was submitted to the USACE in June 2005. The mapped areas included in this report and used to calculate jurisdictional acreage were based on the areas reviewed by the USACE. Because wetland delineations are only valid for a period of 5 years, a re-evaluation of the jurisdictional areas will be performed and submitted to the USACE for approval at the time the project phases are advanced for final design.

2.6.2 Permanent Impacts

The five project phases would result in minor permanent losses of jurisdictional wetlands, totaling 0.009 hectare (0.023 acre). The impacts by phase and location are listed in Table 2.6-1. Permanent impacts would occur where permanent structural improvements (primarily additional bridge piles) have to be placed within wetland areas to support the new structures crossing the creeks.

Table 2.6-1 Summary of Permanent and Temporary Wetlands and Other Waters of the United States Impacted by All Five Project Phases

Project Phases	Location (Type)	Permanent Fill in Hectares (acres)	Temporary Fill in Hectares (acres)
3–5	Grayson Creek / SR-4 mainline	0.001 (0.003)	0.03 (0.07)
3–5	Grayson Creek / SR-4 southeast ramp	0.001(0.003)	0.07 (0.17)
3–5	Walnut Creek / SR-4 (wetland)	0.002 (0.006)	0.12 (0.30)
1 and 2	Grayson Creek / I-680 eastbound ramp widening (wetland)	0.003 (0.007)	0.03(0.091)
1 and 2	Grayson Creek / I-680 northwest ramp (wetland)	0.002 (0.004)	0.13 (0.316)
3–5	Moorhen marsh (wetland)	0	0.01 (0.03)
3–5	Moorhen marsh (other waters of the United States)	0	0.001 (0.002)
3–5	Flood control channel near Moorhen marsh (other waters of the United States)	0	0.003 (0.008)
3–5	Flood control channel (wetland)	0	0.01 (0.03)
Total (All Five Project Phases)		**0.009 (0.023)**	**0.41 (1.01)**

2.6.3 Temporary and Construction-Phase Impacts

Temporary impacts to wetlands and other jurisdictional waters of the United States would occur from construction activities such as the removal and disturbance of vegetation, the installation of temporary access lanes, and the installation of temporary falsework

supports. The temporary impacts for all five phases are also listed in Table 2.6-1. The duration of construction for Phases 1 and 2 is estimated at 2 or possibly 3 years. Construction of the other phases would be of similar duration but is anticipated to occur years later. Construction activities at any one location, however, would be staged within the limits of each phase. For example, the piers for Phases 1 and 2 should be able to be installed within one season, and subsequent work can continue on the elevated flyover ramps without having to re-enter the creek channels. Therefore, the duration of temporary construction activities can be limited to one seasonal period within the actual wetland areas. The contractor will be limited to a seasonal work period specified in the regulatory permits for the project. Installation of piers and work within the creek channels would be planned for the allowable work period. Once work within the creek channels is completed, the channels would be avoided during the remainder of construction of the project (see Section 2.6.4).

2.6.4 Mitigation Measures

The measures described below are proposed to avoid or minimize any potential impacts to wetlands and waters of the United States. Wetlands that exist within the potential project construction area are limited to the I-680 and SR-4 crossings over Grayson and Walnut Creeks, and a small area of marsh and flood control channel located at the northernmost segment of Phase 5 work on I-680 (just north of the BNSF railroad). The area north of the railroad may be further avoidable or disturbance could be minimized by temporarily fencing off the wetland boundary during construction, as this work is at the northernmost boundary of the project limits (this would need to be defined/confirmed during final design). Wetland fill impacts would occur where additional piers are installed for the flyover ramps proposed for the different phases. Those impacts cannot be further avoided. Temporary impacts to wetlands would also occur in construction areas. Measures to avoid or minimize these impacts are discussed below.

Construction Impact Avoidance and Minimization

In general, disturbance to existing grades and vegetation shall be limited to the actual site of the project and necessary access routes. Placement of all roads, staging areas, and other facilities shall avoid and limit disturbance to wetland habitat. Existing ingress or egress points shall be used. Following completion of the work, the contours of the area shall be returned to preconstruction condition or better.

Erosion control and sediment detention devices (e.g., well-anchored sandbag cofferdams, straw bales, or silt fences) shall be incorporated into the project design and implemented at the time of construction. These devices shall be in place during construction activities, and after if necessary, for the purposes of minimizing sediment impact to the wetlands and input to waters of the United States. These devices will be placed at all locations where the likelihood of sediment input exists. A supply of erosion control materials would be kept on hand to cover small sites that may become bare and to respond to sediment emergencies.

All disturbed soils at each site will undergo erosion control treatment before October 31 and after construction is terminated. Treatment includes hydroseeding and sterile straw mulch. Erosion control blankets will be installed on disturbed soils on a gradient of over 30 percent.

Work within the Grayson and Walnut Creek channels will be seasonally restricted. It is expected that the necessary regulatory permits will specify that work within the channels should be limited to a seasonal work period. Temporary construction access to and within the channels would be necessary for installation of new piers. Installation of the piers should be completed within a single year's allowable work period. This work period limitation shall be specified in the construction contracts to ensure that the construction access is considered temporary.

Permanent/Long-Term Mitigation

Permanent revegetation and tree replanting will be performed. Native plant species will be considered for revegetation. Section 2.17.4 outlines conceptual revegetation and planting concepts.

Under Federal and State guidance and rules, adverse, unavoidable impacts to wetlands and other aquatic resources require offsetting or compensatory mitigation. Generally, impacts should be offset by the creation or restoration of new in-kind resources, when practicable, in areas adjacent or contiguous to the impacted site. If on-site mitigation is not practicable, off-site mitigation should be undertaken in the same geographic area if practicable. The total impacts to wetlands are very small (0.009 ha or 0.023 acre for all five phases), and the majority of affected resources are in the Grayson and Walnut Creek channels, which are maintained for flood control and contain limited to moderate functions and values. The opportunity for on-site wetland mitigation is poor, as the flood control channels are concrete lined and are intended and maintained to efficiently pass floodwaters.

Compensatory mitigation could be achieved through use of a mitigation conservation bank (an area of wetland mitigation specifically established and maintained to compensate for impacts of one or more projects). Federal resource agency policy guidance[11] provides, in general, preference for the use of a mitigation bank to compensate for minor aquatic resource impacts in lieu of on-site mitigation, such as where impacts consist of numerous, small impacts associated with a linear project, and are authorized under the USACE nationwide authorization program (see Section 2.6.4).

An established wetland conservation area that can provide wetland mitigation is the Springtown Natural Community Reserve, located in Livermore northwest of I-580 and Vasco Road. The Springtown Natural Community Reserve has a 65 km (40 mile) service area radius, and the I-680/SR-4 interchange project area is located within the service area, approximately 40 km (25 miles) from the reserve. As of 2005, wetland mitigation acreage is available for purchase, and, subject to approval, for use as off-site mitigation. The Springtown Natural Community Reserve is a conservation bank approved by the CDFG to sell mitigation credits for project impacts to seasonal wetlands and California tiger salamander habitat. The operators of the reserve have not sought approval from the USACE to operate as a Federal wetland bank, but the reserve has been used as a site-specific wetland mitigation area for a number of public works and private development projects. The USACE requires permit applicants that wish to use the reserve as a mitigation site to provide a specific wetland mitigation plan with their USACE Section 404 Permit application or a request for authorization under the USACE nationwide permit program. At the time the permits are applied for, an already-developed wetland mitigation area within the existing reserve would be designated for the I-680/SR-4 project.

Another mitigation source, the Muir Heritage Land Trust, is acquiring the 283 ha (700 acre) Fernandez Ranch grant project in the Franklin Ridge area, at the headwaters of Rodeo Creek (about 8 km [5 miles] west of the I-680/SR-4 interchange). The land trust will restore stock ponds, freshwater wetlands, and marshes, and the resources will be managed as a conservation bank. Similar to the process discussed for the Springtown Natural Community Reserve, use of the Muir Heritage Land Trust as mitigation for the I-680/SR-4 project would require approval at the time an application is submitted for the project to the USACE. If a mitigation

[11] Final policy guidance from the USACE, USEPA, National Resource Conservation Service, USFWS, and NOAA Fisheries regarding the establishment, use, and operation of mitigation banks for impacts to waters of the United States and other aquatic resources, memorandum dated December 28, 1995, and Federal guidance on the use of the TEA-21, Preference for Mitigation Banking to Fulfill Mitigation Requirements, under Section 404 of the Clean Water Act, July 11, 2003.

bank were not available or practicable at the time permits are sought prior to construction of the project phases, the USACE can allow for use of an in-lieu fee arrangement where payments are made to fund other restoration projects or programs. Mitigation for wetland impacts must be approved by the USACE and RWQCB following submittal of permit applications.

2.6.5 Wetlands Only Practicable Alternative Finding

Executive Order 11990 requires all Federal agencies to avoid adverse impacts to wetlands unless there is no practicable alternative and to minimize those impacts where unavoidable. Appendix K includes the Wetlands Only Practicable Alternative Finding.

2.7 Vegetation and Wildlife

2.7.1 Vegetation

Regulatory Setting

The U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG) share regulatory responsibility for the protection of special-status plant species. “Special-status” species are selected for protection because they are rare and/or subject to population and habitat declines. Special status is a general term for species that are afforded varying levels of regulatory protection. The highest level of protection is given to threatened and endangered species; these are species that are formally listed or proposed for listing as endangered or threatened under the Federal Endangered Species Act (FESA) and/or the California Endangered Species Act (CESA). See Section 2.8 for detailed information regarding threatened and endangered species.

This section of the document discusses all the other special-status plant species, including CDFG fully protected species and species of special concern, USFWS candidate species, and non-listed California Native Plant Society (CNPS) rare and endangered plants.

The regulatory requirements for FESA can be found at United States Code 16 (USC), Section 1531, et seq. See also 50 CFR Part 402. The regulatory requirements for CESA can be found at California Fish and Game Code, Section 2050, et seq. Department projects are also subject to the Native Plant Protection Act, found at Fish and Game Code, Section 1900-1913, and the California Environmental Quality Act, Public Resources Code, Sections 2100-21177.

Affected Environment

The area surrounding the interchange is a mix of rolling hills, urban and suburban residential and commercial development surrounding existing interchanges and highways, and creek channels and canal crossings. Within the nondeveloped areas, upland ruderal vegetation dominates and small areas of freshwater marsh are present. The upland habitat is primarily made up of ruderal, nonnative grassland but also includes ornamental plantings of nonnative shrubs along the margins of the existing highway corridor and at freeway interchanges. Herbs such as wild oats (*Avena fatua*), slender wild oats (*Avena barbata*), yellow star thistle (*Centaurea solstitialis*), and broadleaf filaree (*Erodium botrys*) are predominant. At the lowest elevations in the project area, freshwater marsh borders the low-flow channels of Grayson Creek.

2.7.1.1 Annual Grassland

Nonnative grasses that were introduced during European settlement of the Central Valley dominate the annual grasslands in the project area. Typical species include annual grasses and herbs such as wild oats, slender wild oats, yellow star thistle, and broadleaf filaree. Native annuals such as California poppy (*Eschscholzia californica*) and vetch (*Astragalus* sp.) are interspersed with nonnative species on the southwest side of SR-4.

Annual grasslands in the project study area are located between residential and commercial areas and the highways and surround the I-680/SR-4 interchange. Some of the ruderal vegetation has been mowed for weed control or for flood capacity maintenance in the stream channels. This is disturbed habitat with no or very small shrubs and isolated trees along the tops of the banks. The annual grasslands at the highway interchanges are nonnative species of annual grasses and shrubs. These areas were determined to provide no nesting habitat and only marginal foraging habitat for bird species of concern such as Lawrence's goldfinch (*Carduelis lawrencei*), tricolored blackbird (*Agelaius tricolor*), or grasshopper sparrow (*Ammodramus savannarum*).

2.7.1.2 Grayson Creek

Grayson Creek is maintained as a flood control channel in the project area. Vegetation and accumulated sediment are periodically removed to maintain the capacity of the channel. Vegetation in the channel consists of annual and perennial species including flatsedge (*Cyperus rotundus*), cattails (*Typha latifolia*), annual rabbit's foot (*Polypogon monspeliensis*), saltgrass (*Distichlis spicata*), and prickly

lettuce (*Lactuca serriola*). The majority of this vegetation is hydrophytic. Wetlands in the project area are described in more detail in Section 2.6.

Immediately east of Grayson Creek is a drainage ditch that contained shallow water and wetland vegetation. Cattails are the dominant vegetation. Although vegetation potentially characteristic of wetlands was noted, the ditch has been excavated in upland soils, and does not connect to other waters of the U.S. Therefore it is not considered jurisdictional.

The aquatic vegetation in the project study area is present along the stream channels in small intermittent fringes, often in strips less than a meter (3 feet) wide and a meter long. This vegetation provides little habitat and would not provide the cover preferred by waterfowl such as the American bittern (*Botaurus lentiginosus*) or for aquatic species such as the western pond turtle (*Clemmys marmorata*). Aquatic vegetation in the marsh area north of the BNSF railroad at the Pacheco Boulevard off-ramp is mostly outside of the project study area. This marsh is large enough to provide habitat for aquatic species but will not be impacted. Small fish and many crabs were observed in the stream channel in Grayson Creek.

2.7.2 Wildlife

Regulatory Setting

Many state and federal laws regulate impacts to wildlife. The USFWS, the National Oceanic and Atmospheric Administration (NOAA) Fisheries, and the California Department of Fish and Game (CDFG) are responsible for implementing these laws. This section discusses potential impacts and permit requirements associated with wildlife not listed or proposed for listing under the state or federal Endangered Species Act. Species listed or proposed for listing as threatened or endangered are discussed in Section 2.8. All other special-status animal species are discussed here, including CDFG fully protected species and species of special concern, and USFWS or NOAA Fisheries candidate species.

Federal laws and regulations pertaining to wildlife include the following:

- National Environmental Policy Act
- Migratory Bird Treaty Act
- Fish and Wildlife Coordination Act

State laws and regulations pertaining to wildlife include the following:

- California Environmental Quality Act
- Sections 1600 – 1603 of the Fish and Game Code
- Section 4150 and 4152 of the Fish and Game Code

Affected Environment

Common bird species such as the western meadowlark (*Sturnella neglecta*), savannah sparrow (*Passerculus sandwichensis*), killdeer (*Charadrius vociferus*), and western kingbird (*Tyrannus verticalis*) use grassland habitat. Other wildlife species such as western fence lizard (*Sceloporus occidentalis*), jackrabbit (*Lepus californicus),* and coyote (*Canis latrans*) are also typically found in grassland habitat. Raptors and small mammals forage in grassland habitat.

Bats are known to use bridge structures for roost sites but prefer vertical crevices sealed at the top, 1.2 to 3.2 centimeters (cm) (0.5 to 1.25 inches) wide, about 30.5 cm (12 inches) deep, and 3 meters (10 feet) or more above the ground. No bats or bat droppings were observed under highway structures, bridges, or in other areas.

There was no evidence of nesting birds under the bridge: no nesting materials or bird droppings were observed. The bridge does not appear to be used for or provide nesting habitat for birds. However, a survey(s) will be performed prior to construction to verify that this condition has not changed. If evidence of use is detected from the preconstruction survey, exclusionary devices would be installed prior to March 1.

2.7.3 Permanent and Temporary Impacts

The project also includes reconstruction of loop ramps at the I-680/SR-4 interchange to allow for the minor expansion of the pavement to accommodate the new lanes and new collector-distributor roads. Landscaped vegetation in the median and along the sides of the right-of-way will be removed. Some trees in the project area may need to be removed to allow for construction. Vegetation along I-680 within the project area has already been removed for construction of the I-680 HOV Lane Project. At least 15 oak trees (*Quercus lobata* and *Quercus berberidifolia*) greater than 6.5 inches in diameter at breast height (DBH) may have to be removed in the vicinity of the on- and off-ramps at Pacheco Boulevard. These trees are listed in Table 2.7-1.

Table 2.7-1 Potentially Impacted Oak Trees

No.	Common Name	Scientific Name	Circumference in inches at 4.5 feet (DBH)	Diameter in inches at 4.5 feet (DBH)	Comments
1	Valley Oak	*Quercus lobata*	63.5	20	On slope just outside right-of-way
2	Valley Oak	*Quercus lobata*	66	21	On slope just outside right-of-way
3	Valley Oak	*Quercus lobata*	42	13	On slope just outside right-of-way
4	Scrub Oak	*Quercus berberidifolia*	33	10.5	In right-of-way next to westbound SR-4
5	Scrub Oak	*Quercus berberidifolia*	73	23	In cloverleaf-like interchange between eastbound SR-4 and Pacheco Blvd., southwest corner
6	Scrub Oak	*Quercus berberidifolia*	33	10.5	In cloverleaf-like interchange between eastbound SR-4 and Pacheco Blvd., southwest corner
7	Scrub Oak	*Quercus berberidifolia*	36	11.5	In cloverleaf-like interchange between eastbound SR-4 and Pacheco Blvd., southwest corner
8	Scrub Oak	*Quercus berberidifolia*	42	13	In cloverleaf-like interchange between eastbound SR-4 and Pacheco Blvd., southwest corner
9	Scrub Oak	*Quercus berberidifolia*	38	12	In cloverleaf-like interchange between eastbound SR-4 and Pacheco Blvd., southwest corner
10	Scrub Oak	*Quercus berberidifolia*	48	15	In cloverleaf-like interchange between eastbound SR-4 and Pacheco Blvd., southwest corner
11	Scrub Oak	*Quercus berberidifolia*	Greater than 20	Greater than 6.5	Not measured due to nearby homeless camp. In cloverleaf-like interchange between eastbound SR-4 and Pacheco Blvd., southwest corner
12	Scrub Oak	*Quercus berberidifolia*	Greater than 20	Greater than 6.5	Not measured due to location in busy/dangerous interchange, about 100 yards from No. 10
13	Scrub Oak	*Quercus berberidifolia*	Greater than 20	Greater than 6.5	Not measured due to location in busy/dangerous interchange, about 100 yards from No. 10
14	Scrub Oak	*Quercus berberidifolia*	Greater than 20	Greater than 6.5	Not measured due to location in busy/dangerous interchange, about 100 yards from No. 10
15	Valley Oak	*Quercus lobata*	25	8	In cloverleaf-like interchange between eastbound SR-4 and Pacheco Blvd, southwest corner

Source: URS survey, January 30, 2003.

The interchange and its associated connecting highways already exist, and the project would not introduce any new barriers to wildlife movement. These impacts are not considered adverse or substantial. Following completion of construction, areas within the interchange that are not landscaped will be seeded for erosion control.

2.7.4 Avoidance Measures

If construction is initiated during nesting season in areas with existing trees that could provide bird nesting, a preconstruction survey should be performed to determine if active nests are present. If an active nest is discovered within 46 meters (150 feet) of the areas to be disturbed, construction should be restricted from the 46-meter (150-foot) area until the nest is vacated and juveniles have fledged. If no construction is planned during this period within 46 meters (150 feet) of potential nesting trees, no surveys are necessary.

Impacts to wildlife and vegetation are not considered substantial, and no specific mitigation is proposed. However, in October of each construction year and at project completion, slopes and graded areas would be reseeded for erosion control. Conceptual project landscaping, including tree replacement, is discussed in Section 2.17.4.

The construction contractor will be directed to control rodent populations prior to clearing and grubbing operations and during the life of the contract. The contractor can only control rodents within the work limits.

2.7.5 Invasive Species

On February 3, 1999, President Clinton signed Executive Order 13112 requiring federal agencies to combat the introduction or spread of invasive species in the United States. The order defines invasive species as "any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem whose introduction does or is likely to cause economic or environmental harm or harm to human health." Federal Highway Administration guidance issued August 10, 1999 directs the use of the state's noxious weed list to define the invasive plants that must be considered as part of the NEPA analysis for a proposed project.

None of the species on the California list of noxious weeds is currently used by the Department for erosion control or landscaping. The landscaping and erosion control included in the project will not use species listed as noxious weeds. In areas of particular sensitivity, extra precautions will be taken if invasive species are found in or adjacent to the construction areas. These include the inspection and cleaning of construction equipment and eradication strategies to be implemented should an invasion occur.

Rodent control is discussed in Section 2.7.5.

2.8 Threatened and Endangered Species

Regulatory Setting

The primary federal law protecting threatened and endangered species is the Federal Endangered Species Act (FESA): 16 United States Code (USC), Section 1531, et seq. See also 50 CFR Part 402. This act and subsequent amendments provide for the conservation of endangered and threatened species and the ecosystems upon which they depend. Under Section 7 of this act, federal agencies, such as the Federal

Highway Administration, are required to consult with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NOAA Fisheries) to ensure that they are not undertaking, funding, permitting or authorizing actions likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. Critical habitat is defined as geographic locations critical to the existence of a threatened or endangered species. The outcome of consultation under Section 7 is a Biological Opinion or an incidental take permit. Section 3 of FESA defines take as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or any attempt at such conduct."

California has enacted a similar law at the state level, the California Endangered Species Act (CESA), California Fish and Game Code, Section 2050, et seq. CESA emphasizes early consultation to avoid potential impacts to rare, endangered, and threatened species and to develop appropriate planning to offset project caused losses of listed species populations and their essential habitats. The California Department of Fish and Game (CDFG) is the agency responsible for implementing CESA. Section 2081 of the Fish and Game Code prohibits "take" of any species determined to be an endangered species or a threatened species. Take is defined in Section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." CESA allows for take incidental to otherwise lawful development projects; for these actions an incidental take permit is issued by CDFG. For projects requiring a Biological Opinion under Section 7 of the FESA, CDFG may also authorize impacts to CESA species by issuing a Consistency Determination under Section 2080.1 of the Fish and Game Code.

2.8.1 Affected Environment

This section evaluates special-status species that occur or are likely to occur within the project study area. Study methods for special-status species consisted of a review of current databases, inventories, agency lists, documentation of existing habitats, and focused surveys.

The study area is a largely built environment, with habitat that has been disturbed as described in Sections 2.6 and 2.7. Surveys were conducted for species with the potential to occur in the study area, and the results are described below.

2.8.1.1 Methods

A combined natural environment study was conducted for the study area for Phases 1 through 5 of the I-680/SR-4 Interchange Improvement Project (URS 2003). Database

records for recorded occurrences of species were searched within a 16-km (10-mile) radius of the project study area. Field surveys were performed in April, May, and September 2002 for the existing and proposed right-of-way for the project and possible construction staging areas. This was the study area for evaluation of biological impacts.

2.8.1.2 Plant Species

Focused botanical surveys were conducted according to the USFWS, CDFG, and California Native Plant Society guidelines to determine presence or absence of the special-status plants. Of the 44 special-status plant species that potentially occur within a 16-km (10-mile) radius of the greater study area (covering Phases 1 through 5), only two had the potential to occur in the habitat types present in the project vicinity: Contra Costa goldfields (*Lasthenia conjugens*) and alkali milk-vetch (*Astragalus tener* var. *tener*).

Contra Costa Goldfields

Contra Costa goldfields is an annual herb in the sunflower family (Asteraceae) that blooms from March to June and is endemic (limited) to California. It is ranked by the California Native Plant Society as extremely rare (CNPS 2001) and listed as endangered under the Federal ESA (listed June 18, 1997; 62 FR 33029). It usually occurs in wetlands, often vernal pools, but is occasionally found in mesic grasslands (CDFG 2002a). Surveys conducted in April and May 2002 did not document sightings of any Contra Costa goldfields in the study area. The last known occurrence of the species near the project area was recorded in 1946 (CDFG 2003).

Alkali Milk-Vetch

Alkali milk-vetch is an annual herb in the pea family (Fabaceae) that blooms from June through October and is endemic (limited) to California. It is a USFWS species of concern and ranked by California Native Plant Society as extremely rare. Alkali milk-vetch usually occurs in wetlands but is occasionally found in mesic sites on fine-textured, alkali soils, on alkaline substrate under vernally flooded conditions, in playa, and in vernal-pool habitats (CDFG 2002a). Alkali milk-vetch has not been recorded in Contra Costa County but was identified in Solano County at a site with similar soils. Therefore, the 2002 surveys conducted for this project sought to identify whether alkali milk-vetch was present in the project area. No alkali milk-vetch was found.

2.8.1.3 Fish and Wildlife Species

The natural environment study (URS 2003) conducted for the proposed project documented animal and bird species (or evidence thereof) in the study area. The study area was also examined for sightings or evidence of bats under highway structures, bridges, and other areas. Bats are known to use bridge structures for roost sites but prefer vertical crevices that are sealed at the top and 3 meters (10 feet) or more above the ground. No special-status mammals or birds were observed in the study area, but the following species are known to occur in the project vicinity.

California Red-Legged Frog

The California red-legged frog (*Rana aurora draytonii*) (CRLF) was listed in May 1996 as threatened under the Federal ESA (61 FR 25813). The CRLF has been designated as a CDFG species of special concern and a protected species under the California Fish and Game Code. These Federal and State designations provide specific protection for the frog and its habitat.

The proposed project location is in the current known range of the CRLF. No occurrences of CRLF have been documented within a 1.6-km (1-mile) radius of the proposed project location. Furthermore, during a September 2002 field survey, no CRLF were observed and no suitable habitat was found in any of the proposed phases of the project study area. The California Natural Diversity Data Base contains five documented occurrences of CRLF within an 8-km (5-mile) radius of the project, primarily in undeveloped areas such as Briones Regional Park (CDFG 2002a).

The project study area may have once contained suitable habitat for CRLF in Grayson and Walnut Creeks. However, channelization for flood control, the lack of a riparian canopy, and limited pockets of emergent vegetation in the channelized creeks has compromised the quality of these habitats. The lack of shade creates habitat for nonnative, warm-water fish, and the lack of cover would subject the CRLF to predation from the fish and crustaceans. These habitat modifications are not compatible with the requirements of the CRLF. The habitat modifications, lack of adequate, continuous riparian cover, and lack of suitable habitat within 1.6 km (1 mile) of the project study area make it unlikely that CRLF would use these streams as movement corridors to and from foraging and breeding areas.

Informal consultation with the USFWS concurred with the conclusion that the project is unlikely to result in the take of the CRLF, and that overall, no further action is necessary under the Federal ESA unless conditions or circumstances change related

to discovery of a listed species at the project area, new information is identified on effects to a listed species not already considered, or new species or habitat is designated that may be affected by the project. Based on this conclusion from the USFWS, the project would have no effect on this species (see Section 2.8.2). USFWS correspondence is included in Chapter 3.

Central Valley ESU Steelhead and Central Valley Chinook

California Central Valley Evolutionary Significant Unit (ESU) steelhead (*Oncorhynchus mykiss*) was listed as threatened on March 19, 1998 (63 FR 13347). This ESU occupies the Sacramento and San Joaquin Rivers and their tributaries, excluding San Francisco and San Pablo bays.

Steelhead are native to the northern Pacific Ocean and in North America are found in coastal streams from Alaska to San Diego County, California (Moyle 1976; Busby et al. 1996). Because steelhead are present year-round, sufficient water flow and cool temperatures are also necessary year-round.

The Central Valley and its tributaries of the Sacramento River support several distinct runs of the chinook salmon (*O. tshawytscha*). The fall/late fall run of the chinook is the most likely to potentially use the area's tributaries. The Central Valley fall/late fall run ESU was designated by NOAA Fisheries as a candidate for listing on September 16, 1999.

Central Valley ESU steelhead and chinook salmon have been seen in Walnut Creek and are considered by NOAA Fisheries to be present. During the walking surveys to evaluate habitat and biological resources on April 18, May 11, and September 9, 2002, no steelhead or salmon were observed in Walnut or Grayson Creeks. Steelhead were observed in Walnut Creek, above the project study area, in March 2001 by NOAA Fisheries personnel (Campbell 2002). According to NOAA Fisheries, steelhead and chinook salmon could use Walnut Creek as a migration corridor to potential spawning grounds in headwaters.

Consultation with NOAA Fisheries was completed for this project with receipt of their letter dated May 18, 2007 (see Appendix H). NOAA Fisheries concluded that the project is not likely to adversely affect Central Valley ESU steelhead or California Central Coast steelhead, provided that protective measures are incorporated into the project.

2.8.2 Permanent and Construction Impacts

No threatened or endangered plant and animal species for which surveys were conducted in 2002 were found in the project study area. Therefore, there would be no effect to Contra Costa goldfields, alkali milk-vetch, or California red-legged frog from this project.

The proposed project may affect, but is not likely to adversely affect, Central Valley or California Central Coast steelhead. This conclusion is based on project commitments to implement the conservation and protective measures outlined in the NOAA Fisheries correspondence included in Appendix H.

NOAA Fisheries also determined that the proposed project activities would not adversely affect Essential Fish Habitat for Pacific salmon. This conclusion is also based on the use of protective measures included in the project, as described in Section 2.8.3.

2.8.3 Mitigation Measures

Measures were developed specifically to avoid or minimize any potential impacts to Central Valley or California Central Coast steelhead and Essential Fish Habitat for Pacific salmon. These measures, summarized below, are based on 2004 correspondence with NOAA Fisheries and the agency's concurrence dated May 18, 2007. The complete correspondence documenting the consultation is provided in Appendix H.

- All work would be conducted during the dry season (June 1 through October 31).
- Work would only occur in a dry channel. If it is necessary to conduct work in a live stream, the work space shall be isolated to avoid construction activities in flowing water. The proposed project shall not dewater the entire stream and shall allow fish passage past the project area. Adequate water depth and channel width must be maintained at all times for fish passage. Prior to construction activities the workspace will be isolated from flowing water to prevent sedimentation and turbidity and avoid effects to fish. The diversion shall remain in place during the project, then be removed immediately after work is complete, in a manner that will allow flow to resume with the least disturbance to the substrate.
- If a project requires dewatering any area, either a pump shall remove water to an upland disposal site, or a filtering system shall be used to collect the water and return clear water to the creek. The pump intake shall be fitted with a fish

exclusion device that meets NOAA Fisheries fish screening criteria (see http://www.nwr.noaa.gov/1salmon/salmesa/pubs/swrscrng.pdf or an equivalent source).

- All materials placed in stream, such as pilings and retaining walls, shall be nontoxic. Any combination of wood, plastic, cured concrete, steel pilings or other materials used for in-channel structures shall not contain coatings or treatments or consist of substances deleterious to aquatic organisms that may leach into the surrounding environment in amounts harmful to aquatic organisms.
- All construction materials and fill will be stored and contained in a designated area that is located away from channel areas to prevent inadvertent transport of materials into the adjacent stream channel.
- Disturbance to existing grades and vegetation will be limited to the actual site of the project and necessary access routes. Placement of all roads, staging areas, and other facilities shall avoid and limit disturbance to streambank or stream channel habitat as much as possible. When possible, existing ingress or egress points shall be used and/or work performed from the top of the creek banks. Following completion of the work, the contours of the creek bed and creek flows shall be returned to preconstruction condition or better with an emphasis on creating easy fish passage through the area. Obvious barriers to fish passage should be removed to facilitate upstream movement.
- Erosion control and sediment detention devices (e.g., well-anchored sandbag cofferdams, straw bales, "Aqua Dam,"[12] or silt fences) shall be incorporated into the project design and implemented at the time of construction. These devices shall be in place during construction activities, and after if necessary, for the purposes of minimizing fine sediment and sediment/water slurry input to flowing water, and of detaining sediment laden water on-site. These devices will be placed at all locations where the likelihood of sediment input exists. A supply of erosion control materials would be kept on hand to cover small sites that may become bare and to respond to sediment emergencies.
- All debris, sediment, rubbish, vegetation or other material removed from the channel banks, channel bottom, or sediment basins shall be disposed of at an approved disposal site. All petroleum products chemicals, silt, fine soils, and any substance or material deleterious to listed species shall not be allowed to pass

[12] Or equivalent device. Information available at www.aquadam.com.

into, or be placed where it can pass into the stream channel. There will be no sidecasting of material into any waterway.

- Any soils within the active channel that are disturbed, moved, or uncovered shall be tested for chemical contaminants. If such soils are found to be contaminated at levels that are deleterious to aquatic life, including salmonids, those soils shall be removed from the area and disposed of in an appropriate upland or off-site facility.
- Fueling, cleaning or maintenance of equipment would be prohibited except in designated areas located as far from the creek as possible. In addition, the contractor would maintain adequate materials onsite for containment and cleanup of any spills.
- After construction and prior to October 31, all disturbed soils at each site would undergo erosion control treatment consisting of temporary seeding, straw mulch, or other measures pursuant to a Storm Water Pollution Prevention Plan (SWPPP) approved by the Regional Water Quality Control Board. Any disturbed soils on a gradient of over 30 percent would also have an erosion control blanket installed. Permanent revegetation or tree replanting should then take place in small openings in the erosion control blanket, with suitable species that are compatible with native vegetation.
- During dewatering activities a fisheries biologist shall be present to salvage chinook and steelhead individuals, should they be present. Fish will be netted, placed in a bucket of water and immediately moved to a downstream portion of the creek. Records of species, relative size, and number individuals shall be kept. Periodic checks of the work area shall occur to ensure that salmonids have not re-entered the work area.
- Project construction activities should be consistent with the requirements of Amendment 14 of the Pacific Salmon Fishery Management Plan pursuant to the Magnuson-Stevens Fishery Conservation and Management Act. These measures include the incorporation of in-water work schedules that avoid Pacific salmon migrations in the project area and application of construction practices (i.e., BMPs) to minimize exposure to sensitive species and areas.

2.9 Geology

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 the California Environmental Quality Act.

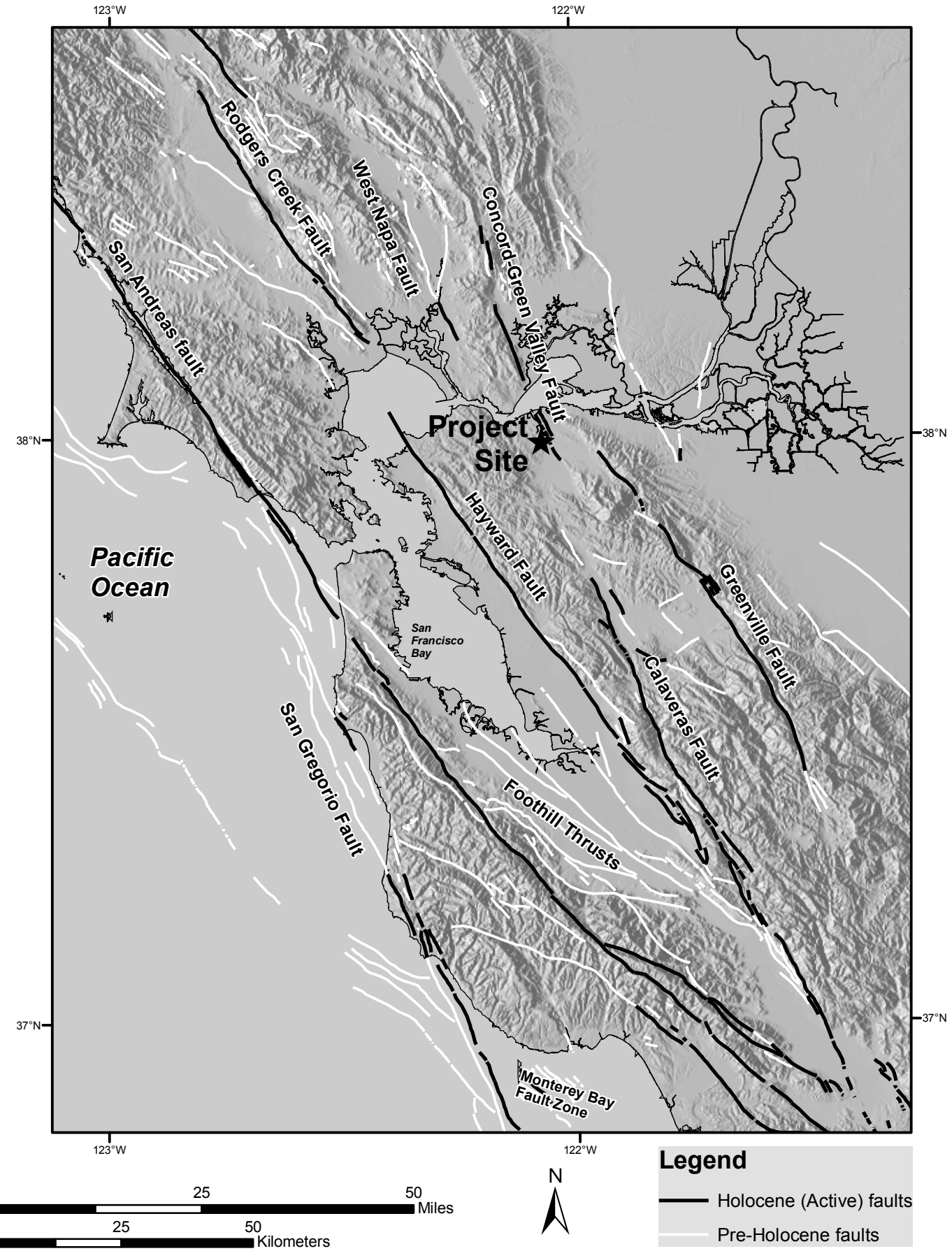
This section also discusses geology, soils, and seismic concerns as they relate to public safety and project design. Earthquakes are prime considerations in the design and retrofit of structures. The Department's Office of Earthquake Engineering is responsible for assessing the seismic hazard for Department 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.

2.9.1 Affected Environment

2.9.1.1 Regional Setting

The project area is located within the San Francisco Bay region, at the northern end of the Diablo Range of the northern Coast Ranges geomorphic province. The Coast Ranges are a north/northwest-to-northwest-trending series of mountains and intervening valleys extending for 960 km (600 miles) from the Oregon border, south to the Santa Ynez River near Santa Barbara. Drainage within the Coast Ranges predominantly follows the northwest-to-southeast geologic structural formation. In the project vicinity, however, the subsurface geologic structure rotates to a more east-west orientation, which is consistent with the west-flowing Sacramento River.

The Bay region is located on the boundary between the North American and Pacific tectonic plates. The Pacific plate is moving northwest relative to North America across a plate boundary oriented in a north-northwest direction that is approximately 100 km wide (60 miles). This zone encompasses all of the major active faults in Northern California (Figure 2.9-1). The average relative motion across this plate boundary amounts to 35 to 38 millimeters (1.4 to 1.5 inches) per year, with the majority of this motion occurring during large earthquakes (Working Group on California Earthquake Probabilities 1999). Geologically, this region is one of the most active in the world, highlighted by the number of large, damaging earthquakes that have occurred during historical time. Major earthquakes have occurred along the margins of the Bay on the San Andreas and Hayward faults in 1836, 1838, 1868, and 1906 (Bakun 1999). Some slip also occurs as a seismic fault creep (i.e., fault movement that does not generate earthquakes) on the Hayward, Concord, and Calaveras faults (Galehouse 1992).



Project No. 26812934 I-680/SR-4 Interchange Improvement Project	MAJOR ACTIVE FAULTS IN THE PROJECT AREA	Figure 2.9-1

2.9.1.2 Site Geology

The project site is located on the southern side of the Sacramento River, on the western side of Ygnacio Valley. South and east of the intersection, the project is located on a flat, low-lying alluvial plain situated between 4 and 12 meters (13 to 39 feet) above mean sea level. To the north and west is the undulating topography of the East Bay Hills.

The project site is underlain by a sequence of marine and estuarine sediments of Tertiary and Cretaceous age (Graymer et al. 1994). These rocks dip moderately to the west and include sandstones, siltstones, and shales. At the eastern extent of the area these rocks include sandstones, siltstones, shales, and conglomerates belonging to the Cretaceous-age Great Valley Group. To the west, these rocks are overlain by Paleocene-age Vine Hill sandstone, which in turn is overlain by Upper Paleocene to Lower Eocene age Las Juntas shale, and then the interbedded sandstones and shales of the Muir, Escobar, Sobrante, and Briones Sandstones. These sedimentary rocks are all generally soft and weathered, producing rounded outcrops and gentle rolling topography. Occasional harder sand and conglomeratic beds form prominent outcrop ridges. The shales and sands are prone to extensive slaking under moist conditions, which can lead to extensive erosion.

The project site is situated in an area of unconsolidated Holocene alluvium and estuarine Bay Mud, ranging from fine-grained carbonaceous silt and clay to medium-grained fine sand, silt, and clay with a few thin beds of coarser sand (Helley and Graymer 1997). This is underlain by weakly consolidated Late Pleistocene alluvium consisting of slightly weathered, interbedded clay, silt, sand, and gravel. This alluvium has been deposited over Pleistocene Old Bay Mud, a sequence of water-saturated estuarine carbonaceous clay and silty clay. Logs of test borings indicate that these unconsolidated deposits are at least 18 meters (60 feet) thick beneath the interchange.

The interchange is located on soils of the Altamont-Diablo-Fontana association, well-drained clays and silty clay loams that formed in materials eroded from soft, fine-grained sandstone and shale on slopes of 9 to 75 percent on the foothills north and east of Mount Diablo. These soils are moderately alkaline and have low permeability. The interchange includes an area of Altamont clay. Runoff is slow to medium when this soil is disturbed, and the hazard from erosion is considered slight to moderate (Welch 1977). The soil has a high shrink-swell potential, has a medium to low shear strength, and is susceptible to piping. It also exhibits medium compressibility and therefore has fair-to-good compaction characteristics.

Several of the other soils that underlie the project area, including Clear Lake clay, Omni clay loam, and Millshom clay, are classified as having high shrink-swell potential. The Sycamore silty clay, Positas loam, and Lodo clay loam have a moderate shrink-swell potential (Welch 1977).

2.9.1.3 Geologic Hazards

This section summarizes the potential geologic hazards in the project area.

Surface Fault Rupture

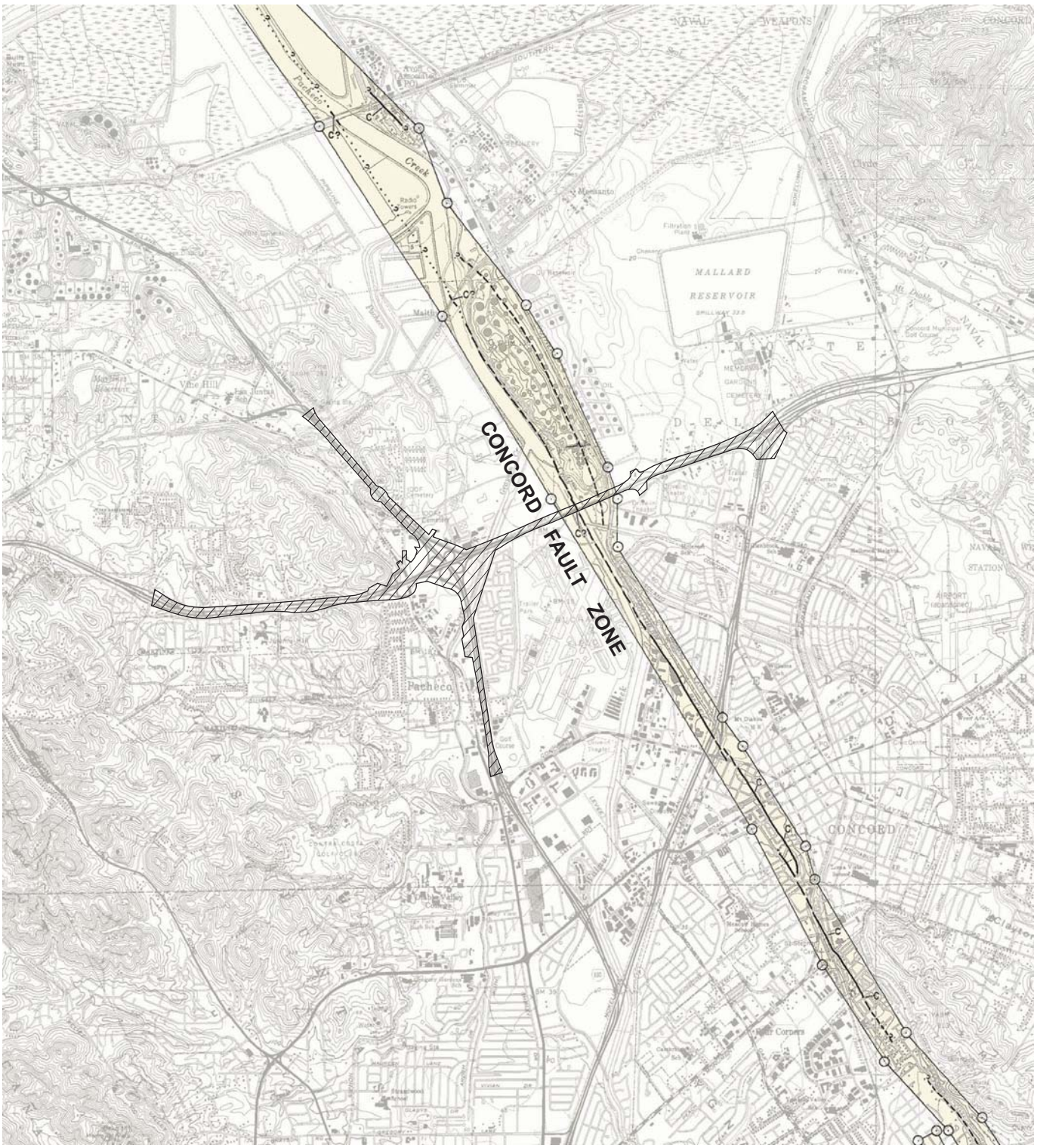
Surface fault rupture is a slip on a fault plane that has propagated upward to, and offset or disturbed, the earth's surface. The Concord fault is the closest active fault to the project (Figure 2.9-2). The fault crosses SR-4 where it intersects Walnut Creek, immediately north of Buchanan Field Airport. Although the Concord fault has not experienced surface rupture in historic time, geologic evidence suggests that the fault can rupture during large earthquakes, causing lateral displacements of about a meter (3 feet) or more at the surface. Displacements for previous events on the fault have not been quantified, but rupture of the fault alone is expected to produce a moment magnitude (**M**) 6.5 earthquake. Rupture of the Green Valley fault to the north is expected to produce a **M** 6.9 earthquake (Working Group on Northern California Earthquake Potential 1996). Using empirical relations of Wells and Coppersmith (1994), these magnitudes yield expected displacements of 0.9 to 1.6 meters (3 to 5 feet).

Earthquake Shaking

Strong earthquake ground shaking is likely the most important seismic hazard that can be expected anywhere in the Bay Area. A deterministic seismic hazard map indicates that this area may experience ground motions of 0.6 g (acceleration equivalent to 60 percent of the force of gravity) or higher (Mualchin 1996).

Flooding and Shallow Groundwater

The project site is located in the northern part of the Ygnacio Valley, a fluvial basin that drains north into the Carquinez Strait. The project crosses the main drainage, Walnut Creek, and one of the main tributaries, Grayson Creek. The confluence of these two streams is located approximately 0.75 km (0.5 mile) north of the project. Smaller tributaries to Grayson Creek flow from the hills to the west and merge with Grayson Creek about 1.5 km (1 mile) south of the I-680/SR-4 interchange. The southern and eastern parts of the project (where I-680 and SR-4 cross Grayson and Walnut Creeks) are located in the Federal Emergency Management Agency (FEMA) 100-year flood zones.



Source: California Geological Survey

N

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

LEGEND

Project Limits

Project No. 26812934 I-680/SR-4 Interchange Improvement Project	ALQUIST-PRIOLO EARTHQUAKE FAULT ZONE	Figure 2.9-2

Liquefaction and Lateral Spreading

Liquefaction is the phenomenon during which loose, saturated, cohesionless soils temporarily lose shear strength during strong ground shaking. Lateral spreading occurs when soil liquefies and flows out of a cut face. A map of liquefaction susceptibility in the seven-county Bay Area was used to assess risk for the project site (Knudsen et al. 2000). The majority of flat locations around the Bay are in areas of soft, potentially liquefiable soils. The liquefaction potential beneath the majority of the project site is classified as high, particularly the southern and eastern portions of the project where Holocene alluvial fan deposits beneath the project site have shallow groundwater and are expected to liquefy at ground accelerations of 0.3 to 0.5 g (Knudsen et al. 2000). The western and northern portions of the project are located on bedrock and therefore have a very low liquefaction potential.

Subsidence

Land surface subsidence can result from both natural and human-made phenomena, including tectonic deformations, seismically induced liquefaction, soil consolidation, and dewatering (e.g., lowered groundwater table). Sections of I-680 immediately north of the project area in the Pacheco Slough vicinity have had major differential settlement problems resulting in subsidence of the road surface. However, no site-specific information or observations of subsidence within the project limits exist.

Expansive Soils

The expansion and shrinking action of some soils can result in differential ground movements. The road surface on the eastbound lanes of SR-4 east of Pacheco Boulevard experienced heave in 1985. This heave was the result of swelling as pyrite in underlying shales was oxidized to gypsum, with a consequent eightfold increase in volume. This situation arose when the original excavation exposed pyrite-bearing clayey shale. Excavation exposing further pyrite-bearing shale could lead to further swelling and heaving.

Landslides

No mapped landslides exist within the project area. Much of the project area, from the I-680/SR-4 interchange south and east, is in an area of relatively flat topography, therefore the hazard from slope movement is negligible. The areas of the project that cut through the undulating topography to the north and west of the interchange may be subject to minor stone fall or slumping as the exposed sandstone and shale is weakened by weathering.

Several small soil slides were reported at the SR-4/SR-242 interchange in 1978. According to Caltrans Geotechnical/Materials files, these were the result of inadequate compaction in fill material.

Tsunami and Seiche

A tsunami (Japanese word meaning "harbor wave") is a water wave or a series of waves generated by an earthquake-induced displacement of the surface of the ocean or other body of water. Tsunami inundation would not be a hazard at the project site.

A seiche is a periodic oscillation or sloshing of water in a water body or basin such as the San Francisco Bay. No large reservoirs are adjacent to the project site; therefore, no hazard from seiche inundation is predicted.

2.9.2 Permanent Impacts

The potential impacts to the geologic environment from the proposed project are presented below.

2.9.2.1 Fault Rupture

The project could potentially be exposed to surface faulting. The Concord fault crosses SR-4 near the eastern margin of the project (Figure 2.9-2). A large earthquake on the Concord fault could result in surface rupture involving a 0.9 to 1.6 meters (3 to 5 feet) or more lateral displacement at the ground surface, possibly disrupting the roadway along SR-4, east of the interchange with I-680.

2.9.2.2 Earthquake Shaking

The Bay Area is seismically active, and all sites in the region have a reasonably high potential of experiencing strong earthquake shaking in the future (Working Group on California Earthquake Probabilities 1999). Elements of the project such as the flyover connectors or any elevated ramps could be exposed to strong ground shaking. A potential exists for substantial damage to engineered structures and risk of injury or loss of life at incorrectly designed or constructed facilities.

2.9.2.3 Liquefaction and Lateral Spreading

The potential for liquefaction at the project site is considered high because the project is in an area of potentially liquefiable soils. A potential exists for damage of structures.

2.9.2.4 Subsidence

Although subsidence is ongoing in areas of the San Francisco Bay, it does not appear to pose a substantial hazard during the lifetime of the project.

2.9.2.5 Expansive Soils

Expansive soil behavior is associated with wetting and drying of soils containing mixed-layer clays and can lead to structural damage. The high groundwater table in the project area indicates that soils in this vicinity are permanently saturated, therefore there is a very low risk of expansive soil behavior.

2.9.2.6 Landsliding

The majority of the project is on flat topography, although several steep road cuts along I-680 and SR-4, west and north of the interchange, may be subject to rock fall and slumping. Slumping has the potential to cause a range of impacts from minor structural damage (impacts from rock fall) to moderate damage to road surfaces and embankments.

2.9.3 Temporary and Construction-Phase Impacts

Excavation and exposure of pyrite-bearing shales located in the western part of the project area may lead to swelling and heaving as pyrite is oxidized to gypsum during construction. In addition, exposure of native and engineered soils during construction activities makes them particularly prone to erosion due to rainfall run off, even on gentle and moderate slopes.

2.9.4 Mitigation Measures

The following measures are recommended for the design and construction of the proposed project. The measures would apply to any of the future phases that may be undertaken in conjunction with this project. These recommendations are based on the preliminary studies conducted to identify geologic conditions and impacts of the project.

Fault Rupture and Subsidence

- Any proposed engineering design would have to be carried out in accordance with Caltrans Seismic Design Criteria and the regulations detailed in the Alquist-Priolo Earthquake Fault Zoning Act. This will involve detailed, site-specific subsurface geologic investigations to accurately locate the active trace(s) of the fault.

- Potential surface deformation resulting from aseismic creep can be mitigated by a regular maintenance program to repair the road surface, curbs, and other engineered facilities. Annual inspection should be carried out to assess ongoing creep damage.

Earthquake Shaking

- Roadways and bridges will have to be designed and constructed at a minimum to the seismic design requirements for ground shaking specified in the Uniform Building Code for seismic zone 4.
- To satisfy the provisions of the 1998 California Building Code, the proposed phase facilities will have to be designed to withstand ground motions equating to approximately a 500-year return period (10 percent probability of exceedance in 50 years). Bridges will have to be designed in accordance with the latest Caltrans Seismic Design Criteria.

Liquefaction and Lateral Spreading

- Site-specific exploratory borings and accompanying laboratory testing during or prior to final design of the project will be required to delineate any potentially liquefiable materials. Potentially liquefiable deposits will either have to be removed or engineered (dewatered or densified) to reduce their liquefaction potential or the engineering design will have to incorporate pile foundations that extend beyond potentially liquefiable deposits.

Expansive Soil

- Site-specific borings and testing should include investigation for subsurface materials that might contribute to heaving. To prevent heaving, pyritic shales should be overexcavated and replaced with fill that will isolate the remaining rock from either air or water.

Landsliding

- Site-specific geologic and geotechnical investigations and laboratory testing, as needed during the final design/PS&E phase, will determine the stability of slopes and their parent material. Using these data, appropriate slope-strengthening and stabilizing designs can be developed and this impact avoided or minimized.

Erosion

- Soil and slope stability measures can prevent or reduce erosion. Erosion of soils during construction can be minimized using temporary hydroseeding to provide a vegetation cover or straw bales, visquine plastic slope cover, and temporary drainage measures to prevent excessive slope runoff. These measures are addressed in more detail in the *Water Quality Report, Interstate 680/State Route 4 Interchange Improvements, Contra Costa County, CA* (URS 2002).

2.10 Floodplains

Regulatory Setting

Executive Order 11988 (Floodplain Management) directs all federal agencies to refrain from conducting, supporting, or allowing actions in floodplains unless it is the only practicable alternative. The Federal Highway Administration requirements for compliance are outlined in 23 CFR 650 Subpart A.

In order to comply, the following must be analyzed:

- The practicability of alternatives to any longitudinal encroachments
- Risks of the action
- Impacts on natural and beneficial floodplain values
- Support of incompatible floodplain development
- Measures to minimize floodplain impacts and to preserve/restore any beneficial floodplain values impacted by the project.

The base floodplain is defined as "the area subject to flooding by the flood or tide having a one percent chance of being exceeded in any given year." An encroachment is defined as "an action within the limits of the base floodplain."

2.10.1 Affected Environment

A floodplain evaluation was performed to determine if the proposed project would encroach on a base 100-year floodplain. In addition, a location hydraulic study was performed that focused on the evaluation of the 100-year flood profile for Grayson and Walnut Creeks where they are crossed by the proposed project phases. A model was used to analyze the effects of all five phases of the proposed project. The

purpose of the study was to evaluate the impacts of the project's development within the local floodplain.

The whole project would be located within the five types of flood zone areas as designated by FEMA's Flood Insurance Rate Map. This is the official map used by FEMA to outline the areas of special flood hazard applicable to a community. The majority of the project, that portion along SR-4 east and west of the I-680 interchange, would be located within a FEMA-designated "Zone C;" Zones X, B, and C are designated areas defined by FEMA as having minimal to moderate flood hazard (for example, residential homeowners are not required by insurance companies to obtain flood hazard policies within these zones). The project would also be constructed in a portion of a "Zone A4" area, which can be inundated by 100-year floods, 0.3 to 0.9 meters (1 to 3 feet), and has base flood elevations and flood factors determined. The flyover ramps for Phases 1 and 2, and the segments of Phases 3 through 5 where the connector ramps and SR-4 median widening cross over the Grayson Creek channel area will be located in a Zone A4 area. North of SR-4, just north and south of the Grayson Creek channel, portions of Phases 3 through 5 would cross over a Zone A area, which is within the 100-year floodplain but has no base flood elevations determined by FEMA. A small portion of the alignment south of SR-4 on I-680 crosses over a "Zone B" area, which is an area between limits of 100-year flood and 500-year flood. Thus, the 100-year flows are not contained within the Grayson Creek channel for the study reach. Floodplain information indicates that under existing conditions, the 100-year flood event would overtop the banks of Grayson Creek and inundate portions of I-680 south of the interchange and SR-4 east of the interchange. This condition already exists and will continue regardless of any changes associated with construction of any of the five phases of the proposed interchange improvements.

Based on FEMA's Flood Insurance Study and maps, the predicted flood overflow of a Base Flood would inundate the mobile home park southeast of the I-680/SR-4 interchange, in addition to the Central Contra Costa Sanitary District Treatment Plant. Again, this could occur without any of the proposed interchange phased improvements. The flooded area would extend from Mobile Drive to the south to Marsh Drive to the east to SR-4 at the northern end.

The existing Grayson Creek channel upstream of Pacheco Boulevard only has the capacity for a 25-year storm. The City of Pleasant Hill is currently the lead agency working with the Contra Costa County Flood Control and Water Conservation

District, USACE, and City of Walnut Creek on providing additional runoff storage capacity while leaving Grayson and Walnut Creeks in a natural state. This may involve construction of a detention basin that would prevent the Grayson Creek 100-year floodplain from affecting the City of Pleasant Hill. This project is estimated for completion in 2012, if or when funding is provided. The project would alleviate the flooding concerns in the vicinity of the I-680/SR-4 interchange. However, because it is only planned and not funded, it is not considered to offset any changes in flooding that might occur with the proposed five phases of improvements for the I-680/SR-4 interchange.

Grayson Creek was modified as part of the Walnut Creek Project, a USACE program to address the increased runoff caused by the high rate of development in Contra Costa County during the 1950s and 1960s. This project included channel shaping, concrete channel lining, improved bridge designs, new culverts and culvert entrances, and levee improvement and construction. Grayson Creek was also modified with construction of 100-year levees along portions of its reach.

Contra Costa County has adopted flood prevention ordinances that provide for development within FEMA-designated flood zones (Contra Costa County 1996). These ordinances are implemented to reduce the risks of flooding and ensure compliance with Federal regulations governing the National Flood Insurance Program. The county has also established planning objectives regarding potential development within flood zones. Any development within the county's jurisdiction would have to comply with these requirements and goals.

Additional requirements governing floodplain development exist at the Federal level. Executive Order 11988, issued on May 24, 1977, describes requirements for evaluation of proposed projects that may encroach upon floodplains. To implement Executive Order 11988, the FHWA issued the *Federal-Aid Highway Program Manual* (FHPM) 6-7-3-2, "Location and Hydraulic Design of Encroachment on Floodplains" on November 15, 1979 (FHWA 1979). Procedures and guidelines provided in Caltrans' *Local Program Manual – Manual III* (1983), which interpret Executive Order 11988 and FHPM 6-7-3-2, were followed to prepare separate analysis of the floodplain in the project area. The Floodplain Risk Assessment and Location Hydraulic Study Report for the I-680/SR-4 project were prepared in April 2004 to comply with Executive Order 11988 and FHPM 6-7-3-2.

2.10.2 Permanent Impacts

Based on the floodplain and location hydraulic studies performed for this project, the proposed highway improvements will not have a substantial impact on Grayson Creek or Walnut Creek floodplain encroachments.

2.10.2.1 Longitudinal Encroachment

As defined by FHWA, a longitudinal encroachment is an action within the limits of the base floodplain that is longitudinal to the normal direction of the floodplain. This highway improvement is not considered longitudinal to the 100-year floodplain or the high-tide waters of the identified floodplain. Therefore, this project would not be considered a longitudinal encroachment.

2.10.2.2 Incompatible Floodplain Development

Incompatible floodplain development is defined as development that is not consistent with a community floodplain development plan. This project would not support any incompatible floodplain development. The project is limited to highway improvements outside the main channel of Grayson Creek.

2.10.2.3 Significant Floodplain Encroachment and Project-Created Flooding Risks

A significant[13] encroachment is defined in the FHPM (FHWA 1979) as a highway encroachment that would cause one or more of the following impacts during construction or flooding: (1) interruption of emergency vehicles or evacuation routes, (2) creation of a significant risk, and (3) creation of a significant adverse impact on natural and beneficial values. The risk would be an increase in the elevation of the base flood levels.

A floodplain evaluation was performed to determine if the proposed project would encroach on a base 100-year floodplain. In addition, a location hydraulic study was performed that focused on the evaluation of the 100-year flood profile for Grayson Creek. As described in Section 2.10.1, the existing interchange is located within the 100-year base floodplain. The location hydraulic study examined flooding and potential project impacts in the immediate vicinity of the project and upstream areas. Effects to the existing base flood conditions from the five project phases would be as follows:

[13] The reference to "significant" is applied here consistent with the FHPM definition for floodplain encroachment and is not used with regard to NEPA.

- Phases 1 and 2: These phases will add new piers within the Grayson and Walnut Creek channels. The predicted maximum change in floodwater elevation is minimal, about 2 cm (approximately 1 inch) at the maximum point of change upstream of Pacheco Boulevard.
- Phase 3: The SR-4 median will be used for expansion of the traffic lanes. No additional water surface elevation changes as a result of Phase 3 are predicted.
- Phase 4: The I-680 southbound to SR-4 eastbound ramp would be constructed above the base floodwater surface elevation. This new bridge does not impact the base flood elevation.
- Phase 5: A new westbound SR-4 to northbound I-680 connector will be built with required auxiliary lanes and SR-4 bridge widening. With all five phases complete, the base floodwater surface elevation is predicted to increase by 0.08 meter (3.5 inches) at the SR-4 and southeast ramp bridges, 0.07 meter (2.7 inches) at the northwest ramp and I-680 bridges, and 0.06 meter (2.4 inches) at the Pacheco Boulevard bridge.

The location hydraulic study concluded that flood risk already exists in this area and that changes due to the interchange project would be negligible (a total of about 2 cm [1 inch] near Pacheco Boulevard) following completion of the first four phases of the interchange improvements. The maximum (cumulative) change at completion of Phase 5 results in a predicted 0.09 meter (3.5 inch) increase in the flood level upstream of the bridges. Thus, some areas surrounding the interchange are already subject to flooding, and the north and south Grayson Creek levees are subject to overtopping as a result of existing conditions. The north levee of Grayson Creek was already increased in height during construction of the I-680 HOV Lane Project to accommodate the changes in the flood surface elevation from both the HOV Lane Project and all the phases of the proposed interchange improvements. Therefore, no additional change or risk would occur on the north side of Grayson Creek as a result of the proposed project. Water elevations south of the creek during a flood event could increase by a maximum of 2 cm (1 inch) at the point of greatest change, near Pacheco Boulevard, with the first four phases in place, and by up to 0.09 meter (3.5 inches) when Phase 5 is completed. The Contra Costa County Flood Control and Water Conservation District was consulted about these changes and concurred that a minor amount of fill could be placed and compacted on the top of the existing maintenance road just upstream of the interchange as necessary to increase existing levee height to offset the changes. This action would be coordinated between CCTA

and the Contra Costa Flood Control and Water Conservation District. This fill would be added to an existing disturbed and already maintained access roadway, on a levee that has been determined in the studies for this project to not meet any local or Federal historic criteria and to not support any sensitive biological resources. The placement of fill would not have an adverse environmental impact.

In addition, as part of the hydraulic studies for this project, the existing levee elevations were also reviewed upstream of the I-680 Grayson Creek bridges and were compared with the 100-year flood elevations. The Grayson Creek channel upstream of the project area also does not have the capacity to convey the 100-year flood, and existing levees will overtop during such an event with or without the proposed interchange improvements. The spilled flows would flank around the existing levees, and consequently the 100-year flood levels would not reach the I-680 Grayson Creek bridges and decking. Because of this condition, the project's changes to floodwater elevations would not impact the ability of the existing bridge structure's capacity to pass floodwaters, and the hydraulic study determined that the proposed new bridge structures need to be designed only to maintain current flow capacity.

The project phases would not cause a significant change in floodplain encroachment, introduce new project-created flooding risks, or result in new flood conditions that might impair emergency routes or service.

2.10.2.4 Natural and Beneficial Floodplain Values

No significant impacts to the natural and beneficial floodplain values have been identified. Natural and beneficial floodplain values within the project area would include the presence of vegetation and natural habitat (including wetlands areas) and fish passage. The project will have minimal impact on the Grayson and Walnut Creek habitats and fish passage, as discussed in the natural environment sections of this report. All environmental impacts would be a result of construction activities and would be mitigated with standard measures such as revegetation and best management practices (BMPs).

2.10.2.5 Encroachment of a Regulatory Floodway[14]

The project would not substantially change flood heights where base flood elevations have been established, based on the preliminary definition of the project and the

[14] A regulatory floodway is a floodplain area designated and reserved by a Federal, State, or local authority to allow or maintain unobstructed flood flows within 0.3 meter (1 foot) of the designated flood elevations.

anticipated structure types. The base flood elevation would not be substantially changed within Grayson Creek, as described in Section 2.10.1.

2.10.3 Construction and Other Temporary Impacts

No substantial impacts to floodplains are expected during construction.

2.10.4 Mitigation Measures

Improvements to the levee height to offset project-related increases in flood levels would be carried out by Contra Costa County and CCTA. No additional floodplain impacts are identified based on the determination that restrictions upstream of the project area would control flood flows in the project area.

2.11 Section 4(f) Parks, Recreational Areas, Wildlife and Waterfowl Refuges, and Wild and Scenic Rivers

The environmental review, consultation, and any other action required in accordance with applicable Federal laws for this project is being, or has been, carried out by Caltrans under its assumption of responsibility pursuant to 23 U.S.C. 327.

Section 4(f) of the Department of Transportation Act of 1966, codified in federal law at 49 USC 303, declares that "it is the policy of the United States Government that special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites."

Section 4(f) specifies that the Secretary [of Transportation] may approve a transportation program or project . . . requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance (as determined by the federal, state, or local officials having jurisdiction over the park, area, refuge, or site) only if:

- there is no prudent and feasible alternative to using that land; and
- the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use.

Section 4(f) further requires consultation with the Department of the Interior and, as appropriate, the involved offices of the Departments of Agriculture and Housing and Urban Development in developing transportation projects and programs that use lands protected by Section 4(f). If historic sites are involved, then coordination with the State Historic Preservation Officer is also needed.

In general, a Section 4(f) use occurs with a Caltrans-approved project or program when: (1) Section 4(f) land is permanently incorporated into a transportation facility; (2) when there is a temporary occupancy of Section 4(f) land that is adverse in terms of the Section 4(f) preservation purposes as determined by specified criteria (3 CFR 771.135[p][7]); and (3) when Section 4(f) land is not incorporated into the transportation project, but the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired (constructive use) (23 CFR 771.135[p][1] and [2]).

The Contra Costa Canal, which was determined to meet the criteria of the National Register of Historic Places (NRHP), is crossed at two locations by the existing I-680 and SR-4 freeways within the project limits. Minor work would be required at the existing crossings. The proposed project would have no effect on the canal (see Sections 2.18.1.2 through 2.18.1.4, and Appendix L).

At Grayson Creek, there is a gravel access road that runs alongside the creek channel for maintenance vehicles from the Contra Costa County Flood Control and Water Conservation District. The maintenance road is also incidentally used by walkers and runners but is not signed, managed, or otherwise designated for such use. The primary or major purpose of the road is for maintenance access by district vehicles and personnel. The maintenance road is not considered a resource under the definition of Section 4(f). No adverse impacts to a Section 4(f) property or resource would occur from any of the project phases.

2.12 Hydrology, Water Quality and Storm Water Runoff

This section discusses hydrology, water quality, and storm water runoff drainage issues. Floodplains are discussed and evaluated in Section 2.10.

Regulatory Setting

Federal and State Regulations

Section 401 of the Clean Water Act (CWA) requires water quality certification from the State Water Resources Control Board (SWRCB) or from a Regional Water Quality Control Board (RWQCB) when the project requires a CWA Section 404 permit. Section 404 of the CWA requires a permit from the U.S. Army Corps of Engineers (Corps) to discharge dredged or fill material into waters of the United States.

Along with CWA Section 401, CWA Section 402 establishes the National Pollutant Discharge Elimination System (NPDES) permit for the discharge of any pollutant into waters of the United States. The federal Environmental Protection Agency has delegated administration of the NPDES program to the SWRCB and nine RWQCBs. The SWRCB and RWQCB also regulate other waste discharges to land within California through the issuance of waste discharge requirements under authority of the Porter-Cologne Water Quality Act.

The SWRCB has developed and issued a statewide NPDES permit to regulate storm water discharges from all Department activities on its highways and facilities. Department construction projects are regulated under the Statewide permit, and projects performed by other entities on Department right-of-way (encroachments) are regulated by the SWRCB's Statewide General Construction Permit. All construction projects over 1 acre require a Storm Water Pollution Prevention Plan (SWPPP) to be prepared and implemented during construction. Department activities less than 1 acre require a Water Pollution Control Program.

Local Regulations

The Contra Costa County General Plan contains the principle statement concerning the county's goal and desires concerning land use and is designed to serve as the basis for development decision making (Contra Costa County 1996). General Plan policies include measures to protect and maintain riparian zones that are applicable to the proposed project.

2.12.1 Affected Environment

2.12.1.1 Surface Water Resources

Surface water in the general vicinity of the project consists of Grayson Creek, Walnut Creek, and the Contra Costa Canal (Figure 2.12-1). Grayson Creek flows from southwest to northeast, first crossing I-680 south of the I-680/SR-4 interchange, then

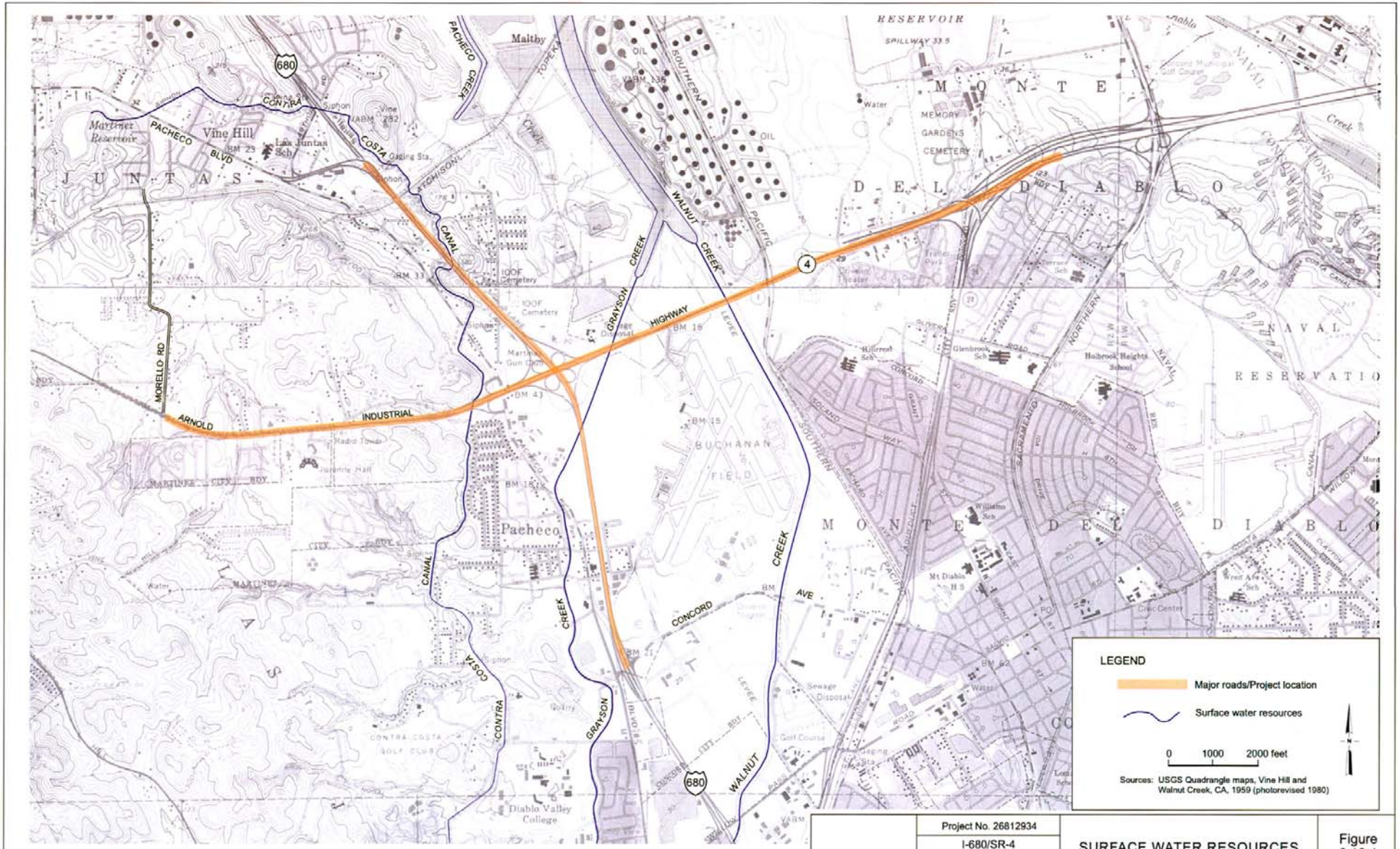
crossing SR-4 east of the interchange. Grayson Creek flows into Pacheco Creek, which ultimately drains into Suisun Bay in the north. Walnut Creek flows in a northerly direction to Suisun Bay and has tributaries of Las Trampas Creek, Tice Creek, San Ramon Creek, and Pine Creek. The Contra Costa Canal is owned by the U.S. Bureau of Reclamation and is operated by Contra Costa County. The canal runs generally north-south on the east side of I-680, flows under the freeway in an enclosed culvert just north of the I-680/SR-4 interchange, and continues in a northerly direction to the Martinez Reservoir and filtration plants.

Water Supply

The primary water supplier to the project area, the Contra Costa Water District, gets the majority of its water from the Sacramento-San Joaquin Delta via the Contra Costa Canal. The Contra Costa Canal draws water from Rock Slough near Oakley, Old River near Discovery Bay, and Mallard Slough in Bay Point (www.ccwater.com/waterquality/where.html). The Contra Costa Water District serves approximately 430,000 people throughout the northern, central, and eastern Contra Costa County with customers including 10 major industries, 36 smaller industries, and approximately 50 agricultural users (CCWD 2000).

Existing Surface Water Quality

The project site is within the jurisdiction of the San Francisco Bay RWQCB (Region 2). The San Francisco Bay RWQCB has the authority to implement water quality protection standards through the issuance of permits for discharge to waters at locations within its jurisdiction. Water quality objectives for the San Francisco Bay estuarine system is specified in *The Water Quality Control Plan for the San Francisco Bay Basin* (Basin Plan) prepared by the San Francisco Bay RWQCB in compliance with the Federal CWA and the State Porter-Cologne Water Quality Control Act. The Basin Plan establishes water quality objectives and implementation programs to meet stated objectives and to protect the beneficial uses of water in the San Francisco Bay basin. Because the project site is located within the San Francisco Bay RWQCB's jurisdiction, all discharges to surface water or groundwater are subject to the Basin Plan requirements (RWQCB 1995).


LEGEND
Major roads/Project location
Surface water resources
0 1000 2000 feet
Sources: USGS Quadrangle maps, Vine Hill and Walnut Creek, CA, 1959 (photorevised 1980)
Project No. 26812934
I-680/SR-4 Interchange Improvement Project
SURFACE WATER RESOURCES
Figure 2.12-1
26812934.03800/080103/gos

Surface water samples from Walnut Creek and its two main tributaries, Las Trampas and San Ramon Creeks, indicated good water quality in that the results met most water quality criteria for aquatic life (RWQCB 1995). The California Department of Water Resources Water Data Information System for Walnut Creek at SR-4 and Pine Creek, a tributary to Walnut Creek, indicate that the water quality is generally within the municipal water objectives set forth in the Basin Plan for San Francisco Bay and is less than USEPA's ambient water quality criteria. The data suggest that nitrate (NO_3) occasionally exceeds the available water quality criteria for municipal use. Furthermore, based on typical values for total dissolved solids, surface water ranges from medium to hard water.

The Central Contra Costa Sanitation District monitors water quality in Suisun Bay in compliance with its National Pollutant Discharge Elimination System (NPDES) permit. Water quality data for Suisun Bay are shown in Table 2.12-1. Table 2.12-2 shows metals data collected by the Regional Monitoring Program in Suisun Bay near Pacheco Creek. Some metals common in highway runoff including copper and nickel occasionally exceed Bay water quality objectives. Table 2.12-3 shows constituents in storm water runoff from I-680 at locations just south of the Benicia-Martinez Bridge. Concentrations of lead, copper, chromium, and zinc (common in highway runoff) measured at these locations along I-680 are typical of monitoring measurements along other Bay Area highways (e.g., Highway 101 and other segments of I-680) (Caltrans 1998).

2.12.1.2 Groundwater Resources

The interchange area is located over the Ygnacio Valley portion of the Livermore groundwater basin (DWR 1980). Drilling records show depths to groundwater in the vicinity of the project (Concord, Martinez, Pleasant Hill, and Walnut Creek) averaging 5.3 meters (17.38 feet) (www.greggdrilling.com/water_table_n.html). This average is consistent with data from the U.S. Geological Survey that indicate groundwater depths have ranged from 2.17 to 6.32 meters (7.13 to 20.75 feet) in the Ygnacio and Clayton Valley areas from 1958 to the present (www.waterdata.usgs.gov/ca/nwis/gwlevels).

Limited groundwater data are available in the project vicinity. Groundwater resources in the Contra Costa Water District service area do not supply substantial amounts of water to meet or augment raw water demands. Of the three discernable groundwater sources in the vicinity of the project – Ygnacio, Clayton, and the Pittsburg/Antioch areas – only the Clayton area produces appreciable amounts of groundwater. The Contra Costa Water District does not monitor groundwater levels

Table 2.12-1 Suisun Bay Water Quality

Station No.	Sample Type	Station ID	Time (AM)	Oil and Gasoline	Grease	Algae and Other Microscopic Materials	Atmospheric Odor	Turbidity	Color	Sampling Depth (cm [inches])
C1	Grab	Center	0914	None	None	None	None	(NTU)	Light yellow	10 (4)
C2	Grab	West	0912	None	None	None	None	29	Light yellow	10 (4)
C3	Grab	North	0908	None	None	None	None	16	Light yellow	10 (4)
C4	Grab	East	0909	None	None	None	None	19	Light yellow	10 (4)
C5	Grab	South	0911	None	None	None	None	21	Light yellow	10 (4)
C8	Grab	Control	0916	None	None	None	None	25	Light yellow	10 (4)

Station No.	Station ID	Total Coliform (mpn/100 mL)	pH	Temp °C	DO (mg/L)	DO Saturation %	NH_2 as N (mg/L)	Non-Diss NH_2 as N (mg/L)	Salinity (g/kg)	Dissolved sulfides (mg/L)	Conductivity µmhos/cm
C1	Center	210	7.3	11.1	10.8	99.1	0.13	0.001	4.4	<0.1	7,860
C2	West	1700	7.4	10.5	10.4	92.9	0.34	0.001	4.8	<0.1	8,660
C3	North	220	7.4	10.3	10.3	94.1	0.23	0.001	4.4	<0.1	7,930
C4	East	130	7.4	10.2	10.4	95.9	0.15	0.001	4.4	<0.1	8,000
C5	South	300	7.4	10.5	10.5	95.6	0.15	0.001	5.0	<0.1	8,880
C6	Control	300	7.4	10.0	10.4	94.7	0.17	0.001	4.6	<0.1	8,200

Source: Central Contra Costa Sanitation District 1998.
Notes: Data are for samples taken January 13, 1998.

DO = Dissolved oxygen
g/kg = grams per kilogram
mg/L = milligrams per liter
mpn/100 mL = most probable number per 100 milliliters
N = Nitrogen
NTU = Nephelometric turbidity unit
µmhos/cm = micromhos per centimeter

Table 2.12-2 Concentrations of Total Metals Collected Near Pacheco Creek, 1996-2000

Date	Silver (µg/L)	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Lead (µg/L)	Selenium (µg/L)	Zinc (µg/L)
02/13/96	0.009	1.95	0.02	9.6	4.6	0.009	7.1	0.9	0.14	8.4
04/24/96	0.004	1.37	0.02	3.3	2.6	0.006	2.8	0.5	0.12	3.3
07/22/96	0.006	2.61	0.05	5.6	3.8	0.011	5.3	1.2	0.16	5.3
01/28/97	NA	3.16	0.04	17.95	7.6	0.0298	16.6	1.78	0.15	13.5
04/23/97	NA	2.98	0.06	11.47	5.7	0.0199	9.9	**	0.25	13.5
08/05/97	NA	3.55	0.06	12.3	4.4	0.0145	6.3	**	0.21	9.8
02/3/98	0.017	2.8	0.05	13.4	5.1	0.0121	6	1.21	0.21	12.9
04/15/98	0.008	1.72	0.02	6	3.4	0.0073	4	0.58	0.32	5.6
07/28/98	0.014	3.7	0.05	13.97	7.7	0.0237	11.9	1.67	0.22	21
02/10/99	0.007	1.8	0.024	7.03	4.4	b 0.0100	8.5	1.15	0.09	6
04/20/99	0.008	1.79	0.041	20.99	8.1	b 0.0286	13	2.67	e 0.05	17.3
07/20/99	0.009	2.8	0.043	122.18	4.3	b 0.0105	5.5	0.92	0.22	5.8
02/8/00	NA	2.28	NA	NA	NA	b 0.0162	NA	NA	ND	NA
07/18/00	NA	3.41	NA	NA	NA	Q	NA	NA	0.129	NA
Water Quality Objectives	2.3***	36*	9.3*	11*	2.9**	0.025**	8.3**	5.6*	71**	58*

Source: SFEI 1996–2000 (data downloaded from Web site)

* San Francisco Bay Basin Plan Objective (4-day average)
** USEPA National Toxics Rule (4-day average)
*** Instantaneous maximum

b = blank contamination
e = estimated value
Q = outside the QA limit
µg/L = micrograms per liter

Table 2.12-3 Storm Water Runoff Analysis at Various Locations in I-680 Just South of the Benicia Bridge

Constituent	Location					Detection Limit
	1	2	3	4	5	
Total recoverable petroleum hydrocarbons	ND	ND	ND	ND	2.1	1.0 mg/L (ppm)
Lead	0.0082	0.0035	0.015	NA	0.014	0.0020 mg/L
Copper	0.029	0.023	0.034	NA	0.027	0.0020 mg/L
Chromium	ND	ND	0.0096	NA	0.0052	0.0050 mg/L
Zinc	0.081	0.047	0.093	NA	0.087	0.010 mg/L

Source: Caltrans 1998.

mg/L = milligrams per liter
NA = not applicable
ND = not detected
ppm = parts per million

or quality but estimates that approximately 3,000 acre-feet per year is pumped from groundwater wells owned by private individuals, industries, and public water utilities (CCWD 2000). Groundwater resources in the area do not represent a sole source aquifer (www.epa.gov/safewater/swp/ssa/reg9.html).

Wellhead Protection

Wellhead protection is a preventive program designed to protect public water supply wells. The goal of wellhead protection is to prevent contaminants from entering public water supply wells by managing the land that contributes water to the wells. Because the I-680/SR-4 interchange is in an area that does not have a public water supply from groundwater wells, planning for wellhead protection is not necessary.

Groundwater Quality

Groundwater is not monitored by any agency in Contra Costa County, primarily because the majority of the county gets its water from the Contra Costa Canal. Water quality in the Ygnacio Valley Basin is generally poor and has been limited primarily to agricultural uses. The RWQCB Basin Plan lists municipal, industrial process, industrial service, and agriculture as potential but not existing beneficial uses of that water body. Groundwater quality in the Clayton Valley Basin is generally better than in the Ygnacio Valley Basin; however, municipal wells in the basin were replaced by Mallard Reservoir. The Basin Plan lists municipal water supply as the only existing beneficial use.

2.12.2 Permanent Impacts

The following summarizes potential project impacts.

2.12.2.1 Surface Water

Drainage and runoff patterns would be affected but not adversely impacted. The proposed project crosses the 100-year floodplain of Grayson Creek. The Grayson Creek crossings would be constructed to allow the runoff from this event to pass through, maintaining approximately the same drainage patterns. Floodplain impacts are discussed in Section 2.10.

2.12.2.2 Storm Water Runoff Volume and Quality

A Storm Water Data Report prepared for the proposed project details the estimated increase in impervious surfaces and the BMPs that would be considered to treat the runoff from the roadway. Storm water runoff volumes from the project area are expected to increase due to the increase in impervious surfaces. The increase in impervious area would be approximately 5.5 ha (13.6 acres). The additional runoff from this change is not anticipated to exceed the capacity of drainage systems in the area. Storm water from the I-680/SR-4 Interchange Improvement Project would drain into Grayson and Walnut Creeks and Contra Costa Canal as well as storm drain systems in the area. This storm water would ultimately discharge to Suisun Bay.

Street and highway storm water runoff can, in some instances, adversely affect receiving water quality (FHWA 1990). The nature of these impacts depends on the uses and flow rate or volume of the receiving water, rainfall characteristics, and street or highway characteristics. In general, heavy metals associated with vehicle tire and brake wear, oil and grease, and air emissions are the primary toxic pollutants associated with transportation corridors. Section 2.12.4.1 describes the BMPs that will be incorporated into the project to treat storm water runoff.

2.12.3 Construction and Other Temporary Impacts

During construction there is the risk of temporary adverse impacts due to increased erosion that could eventually be transported into nearby creeks and storm drains with storm runoff. Storm water runoff could drain into Grayson Creek, Walnut Creek, or the Contra Costa Canal, and eventually be transported to Suisun Bay. Soil erosion could, especially during heavy rainfall, increase suspended solids, dissolved solids, and organic pollutants in nearby creeks. These conditions can persist until completion of construction activities and implementation of landscaping and other long-term erosion control measures (described in Section 2.12.3).

Fueling or maintenance of construction vehicles would occur in the project area during construction. Accidental spills or releases of fuels, oils, or other potentially toxic materials and possibly sanitary wastes could be a concern during construction activities. An accidental release of these materials may pose a threat to water quality if contaminants enter storm drains, Grayson Creek, Walnut Creek, or the Contra Costa Canal.

The project does not involve substantial excavations that could affect groundwater resources. Some excavation would be required to set the footing of the piers that support the flyovers, and some excavation could be involved with the location of the new connector roads, but the project is primarily located aboveground and would involve placement of fill. In addition, groundwater resources in the area do not represent a sole source aquifer.

2.12.4 Mitigation Measures

2.12.4.1 Construction

Construction activities could increase suspended solids, dissolved solids, and organic pollutants in nearby creeks or the Contra Costa Canal. These conditions could likely persist until completion of construction activities and long-term erosion control measures have been implemented. Since this project has a soil disturbance of 0.4 ha (1 acre) or more, this project shall adhere to the conditions of the NPDES Permit for Construction Activities (Order No. 9-08-DWQ, NPDES No. CAS000002), which is incorporated by reference to the Caltrans NPDES Permit, Storm Water Discharges from Caltrans Properties, Facilities, and Activities (Order No. 99-06-DWQ, NPDES No. CAS000003). Filing of a Notice of Intent is not required, as a Notification of Construction under Caltrans NPDES Permit has replaced it. To comply with the conditions of the Caltrans NPDES Permit and to address the temporary water quality impacts resulting from the construction activities of this project, Standard Special Provision 07-345 will be included in the Plans, Specifications, and Estimates. This SSP will address water pollution control work and the implementation of a SWPPP during construction.

Construction best management practices are temporary BMPs that Caltrans contractors would implement to meet Best Available Technology/Best Conventional Technology for construction projects. An area of approximately 19 ha (47 acres) of impervious roadway surfaces (new and existing) is preliminarily proposed for treatment by BMPs. The selected construction site BMPs would be consistent with

those practices to achieve compliance with requirements of the State of California NPDES General Permit for Storm Water Discharges Associated with Construction Activities.

Construction BMPs that have been identified in the project's Storm Water Data Report (May 2005) include the use of vegetated swales to minimize velocity and erosive conditions and revegetation of slopes to reduce erosion and sediment loads. Other construction BMPs that may be set forth in the SWPPP include using temporary mulching, seeding, or other suitable stabilization measures to protect uncovered soils; storing materials and equipment to ensure that spills or leaks cannot enter storm drain systems or surface water; developing and implementing a spill prevention and cleanup plan; installing traps, filters, or other devices at drop inlets to prevent contaminants from entering storm drains; and using barriers such as straw bales or plastic to minimize the amount of uncontrolled runoff that could enter drains or surface water. Because of piling operations, construction dewatering BMPs will also be included in the SWPPP and implemented during construction to prevent any non–storm water from entering into waterways or environmentally sensitive areas.

Erosion control measures would be developed as part of the SWPPP and applied to exposed areas during construction. Erosion control measures may include the trapping of sediments within the construction area by placing barriers such as straw bales, sandbags, or gravel barriers at the perimeter of downstream drainage points. Other methods of minimizing erosion impacts include limiting the amount and length of exposure of graded soil, hydromulching and hydroseeding (applying a mixture of mulch, seed, and fertilizer), and other soil protection measures such as straw mulch or compaction.

The overall mitigation structure for water quality impacts is a condition of the NPDES permit, other planning agreements, and the expected need for county storm water management programs. Implementation details for all BMPs would be developed and incorporated into the SWPPP, project design, and operations before project construction. With proper implementation of these measures and compliance with the new NPDES permit, short-term construction-related water quality impacts would be avoided or minimized.

2.12.4.2 Long Term

The project design will incorporate Design Pollution Prevention (DPP) BMPs. DPP BMPs are intended to stabilize soil and prevent contaminants and soil from entering

storm water runoff. Another category of BMPs called Permanent Treatment BMPs are intended to treat storm water runoff and remove contaminants and sediments that have already entered the runoff. The project's NPDES permit will likely stipulate that Permanent Treatment BMPs to control pollutant discharges be considered and implemented for all new or reconstructed facilities. Permanent Treatment BMPs that are generally considered are infiltration basins, detention basins, and biofiltration swales/strips.

Although design plans for the interchange have not been finalized, the use of existing biofiltration swales will likely be the primary Permanent Treatment BMP. An existing biofiltration swale already exists in the southwestern corner of the interchange area, adjacent to Grayson Creek, and treats runoff from portions of the western half of the interchange area. This swale will remain in place with the interchange project modifications. Additional drainage areas that can be used as biofiltration swales have been identified in the Storm Water Data Report along most of both sides of SR-4 within the project limits and on short segments of I-680. The swales will be designed to also minimize velocity and erosive conditions. New and existing slopes that are disturbed will be vegetated, and an erosion control plan will be developed. Outlet protection/energy dissipation devices consisting of flared end sections and rock slope protection will be provided at all newly constructed outlets to reduce velocities and prevent scouring and sediment resuspension.

The use of large infiltration or detention basins is generally not considered feasible for modifying or controlling large storm events because of the lack of necessary right-of-way in the interchange area. The only area identified for a potential small detention basin (or swale area) is west of I-680 and south of Grayson Creek. This basin or swale can be considered during final design, but the use of the biofiltration measures discussed above is considered more feasible and practicable.

Existing storm sewer subcatchments within the project site drain directly into drainage inlets, which lead to deep trunk storm sewer systems. These systems drain directly to Grayson Creek. Storm water treatment of these systems was considered, but to construct a new treatment facility and to reconstruct large portions of the existing storm sewer system to divert storm water to a treatment facility was determined to be cost-prohibitive.

2.13 Farmlands/Agricultural Lands

2.13.1 Affected Environment

Contra Costa County ranks 38th among 58 counties in agricultural production in the State of California, which represents approximately 0.3 percent of the State's total production. In 2001, Contra Costa County produced $97.5 million in agricultural commodities (Contra Costa County Farm Bureau). Although Central Contra Costa County once supported large farmland areas, agricultural uses are now relatively limited. Within the project study area, no agricultural uses occur.

2.13.2 Permanent and Temporary

No impacts to agricultural resources would take place because no active agricultural lands occur within the project area.

2.13.3 Mitigation Measures

No agricultural lands would be affected by the project.

2.14 Community Impacts (Social, Economic) and Environmental Justice

The selected community impact assessment study area (study area) represents a logical area around the existing and proposed right-of-way where direct project impacts would most likely occur (Figure 2.14-1). The study area primarily includes large portions of the unincorporated areas of Vine Hill and Pacheco in Contra Costa County. It also incorporates the northeastern portion of the City of Martinez.

Census data obtained for the study area are at the Census Tract (CT) level. Although the CTs cover areas larger than the study area described, they most closely and comprehensively represent the area. Census Tracts selected to describe the study area include CT 3200.02, CT 3211.01, CT 3212, and CT 3270 (see Figure 2.1-1). In addition to the census data for the census tracts, data for the entire Contra Costa County (Study Region) are used.

2.14.1 Affected Environment

2.14.1.1 Population

The study area represents roughly 2.8 percent of Contra Costa County's population. According to the 2000 U.S. Census, Contra Costa County had a population of 948,816. This represents an 18 percent increase from the 1990 population count. Similarly, the study area (based on CT-level data) experienced a 17 percent population increase between 1990 and 2000, from 24,216 to 26,963. Within the study area, the most growth was experienced in CT 3200.02, an area that encompasses the entire northern portion of the project area (north of SR-4, stretching from Pine St. on the west to Solano Way on the east). Between 1990 and 2000, the population in CT 3200.02 grew by 31 percent. Growth in CT 3212 was 11 percent and in CT 3270 was 7.5 percent. In CT 3211.01, the population decreased from 6,769 in 1990 to 6,526 in 2000.

2.14.1.2 Age

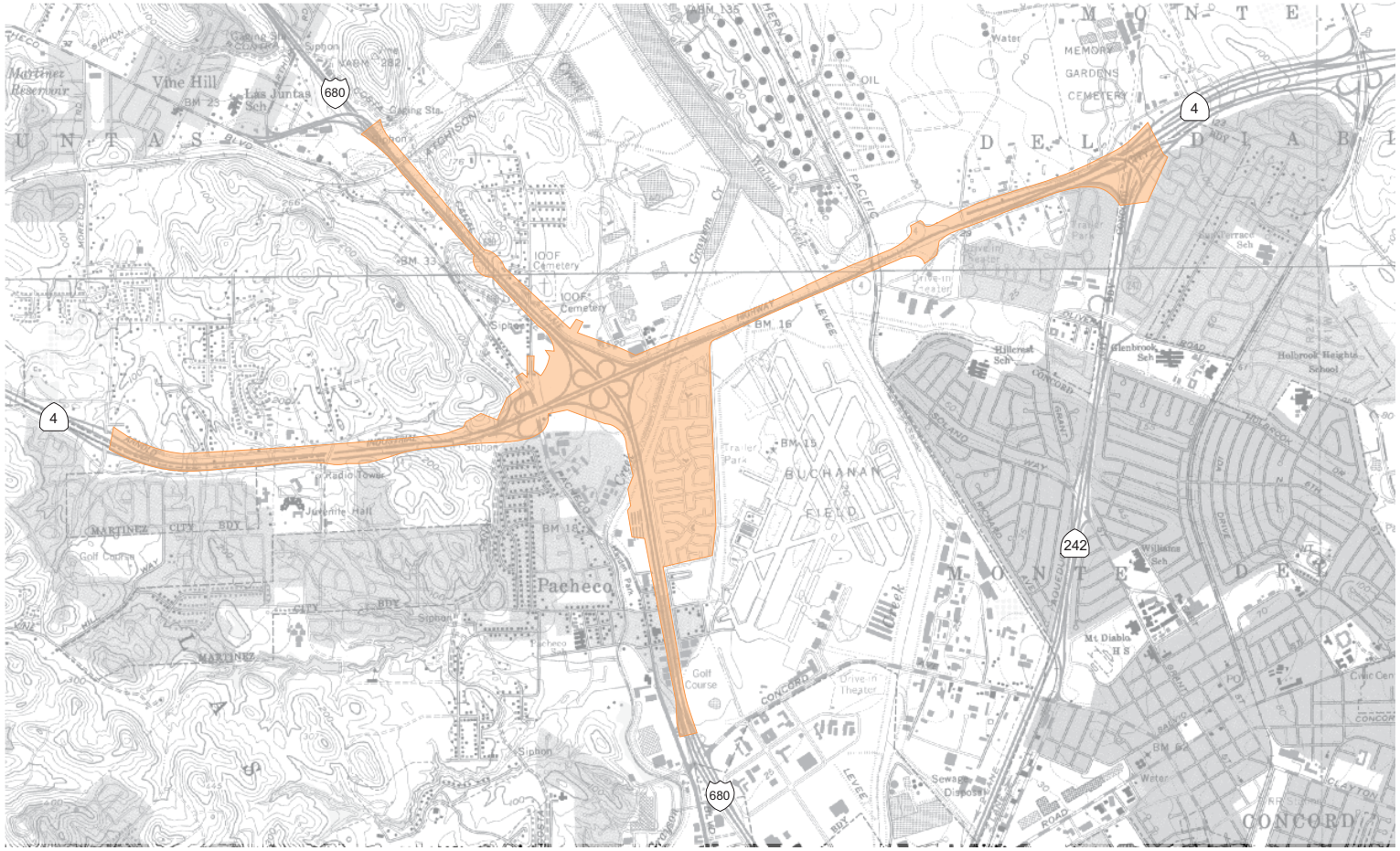
For the most part, the age composition of the study area population reflects the regional age composition. Over 50 percent of people fall between the ages of 25 and 64. CT 3270, however, has a greater percentage of senior citizens (15.2 percent) than the county average of 11.3 percent.

2.14.1.3 Race/Ethnicity

Compared to the racial compositions of the Study Region, the study area has a greater percentage of whites and a lower percentage of African American persons. The study area also has fewer persons who identify themselves as Hispanic or Latino. CT 3270 is a clear exception, with nearly one-quarter of its residents being of Hispanic or Latino heritage.

2.14.1.4 Income and Poverty

Median income levels for the study area are comparable, on average, with the county figure (see Table 2.14-1). The median household incomes within CT 3200.02 and CT 3211.01 are much greater than those of CT 3212 or CT 3270, which are below the average for the Study Region. Per capita income from 1990 also demonstrates this trend. While poverty levels are generally below the regional average in CT 3200.02 and CT 3211.01, they appear to be higher than the regional averages in both CT 3212 and CT 3270. For example, 5.4 percent of families and 7.6 percent of individuals in Contra Costa County live below the poverty line, compared with 10.2 percent of families and 13 percent of individuals in CT 3212. CT 3270 is closer to the regional averages but also falls below the regional thresholds.



Source: USGS 7.5 min. Quadrangle Maps, Walnut Creek and Port Chicago, CA, 1959

LEGEND

Community Impact Assessment Study Area

Project No. 26812934 I-680/SR-4 Interchange Improvement Project	COMMUNITY IMPACT ASSESSMENT STUDY AREA	Figure 2.14-1

26812934.31300/080103/gos

Table 2.14-1 Income in 2000

Attribute	Contra Costa County	CT 3200.02	CT 3211.01	CT 3212	CT 3270
Median household income ($)	63,675	68,446	67,128	54,882	42,063
Per capita income ($)	30,615	30,839	28,597	28,576	18,891
Number of persons below poverty level	71,575	467	183	680	706

Source: U.S. Census 2000 (STF3), http://factfinder.census.gov

2.14.1.5 Housing

The 2000 U.S. Census reports that 354,577 total housing units exist in the Study Region, of which 344,129 are occupied. The vacancy rate is approximately 2.9 percent, which indicates a generally high demand for housing. According to the County General Plan, the county had a vacancy rate of 2.7 percent in 1988. The U.S. Census data indicate that the median home value in Contra Costa County was $267,800, and the median household income was $63,675.

By comparison, the study area had a total of 11,129 housing units, of which 10,884 units were occupied in 2000, an average vacancy rate of 2.3 percent. The median home value in the study area, $223,625 in 2000, was slightly lower than the Study Region.

2.14.1.6 Employment and Unemployment

The services industry employs about 32 percent of the workers in Contra Costa County. Between 1999 and 2006, county forecasts estimate that 27,600 jobs will be added in the business, health, and other service areas (ABAG Projections 2002). Other major employment sectors for the county include retail trade, auto repair, amusement and recreation, and social services. Retail trade is projected to grow by 11.4 percent by 2006.

The unemployment rate in the county has averaged about 3.3 percent over the past 5 years, which is less than the State average (5.5 percent) over the same period. Currently, the State unemployment rate is slightly below its average (5.3 percent), while the county unemployment rate remains at 3.3 percent.

The unemployment rate in the study area has mirrored that of the county over the past 15 years and continues to do so. Data for the Pacheco and Vine Hill communities indicate that the study area unemployment rate (2.8 percent) is slightly lower than that

of the Study Region. The study area seems to maintain a strong dependency on the services sector. Based on ABAG projections to the year 2025, job growth will outpace population growth (ABAG Projections 2002).

2.14.1.7 Transportation to Work

Over 65 percent of the total population over 16 years of age in Contra Costa County was employed in 2000. Of the 442,008 people who commuted to work, only 9 percent took public transportation. By contrast, 83.7 percent either drove alone or carpooled. The average commute time for county residents in 2000 was 34.4 minutes. ABAG projections to the year 2025 indicate that job growth in the county would exceed population growth by approximately 10 percent. This pattern is reflected in the study area, except for CT 3211.01, where the population growth is expected to outpace employment growth by 3.3 percent (ABAG Projections 2002). In the study area, the average commute time for residents, approximately 29 minutes, was less than that of the county, due in part to the study area's proximity to the highway network. In 2000, the mean commute time was 29.4 minutes for CT 3200.02, 28 minutes for CT 3211.01, 31.7 minutes for CT 3212, and 27.2 minutes for CT 3270. However, without improvements to the local transportation network, the expected employment growth in the area may lead to longer commute times.

2.14.2 Community Services and Facilities

2.14.2.1 Schools

Although no schools exist within the study area, at least eight public schools from the Martinez Unified School District and the Mt. Diablo Unified School District serve residents in the project vicinity. The four elementary schools for the area are John Muir Elementary School (205 Vista Way), Morello Park Elementary School (244 Morello Ave.), Las Juntas Elementary School (4105 Pacheco Boulevard), and Sun Terrace Elementary School (2448 Floyd Lane). The two middle schools in the area are Martinez Junior High School (1600 Court St.) and Glenbrook Middle School (2351 Olivera Road). The two high schools for the area are Alhambra Senior High School (150 E St.) and Montecito High School (600 F St.).

2.14.2.2 Parks and Recreation

The study area contains three large community parks: Holiday Highlands Park, located at Fig Tree Lane and Eastwoodbury Lane in Martinez; Hillcrest Community Park, at Olivera Road and Grant St. in Concord; and Sun Terrace Park, located at Vancouver Way and Montreal Circle in Concord.

Other parks are located outside of the study area but within the general vicinity. They include Morello School Park, at Morello Avenue and Morello Park Drive; Bayview Circle Park in Concord at Bayview Circle; Mountain View Park at Parkway Drive in Martinez; and John Muir Park at Vista Way in Martinez.

2.14.2.3 Park and Ride Lots

Park and ride lots help encourage transit use and carpooling. Bay Area Rapid Transit (BART) operates 12 lots with more than 11,800 free parking spaces for BART customers. Caltrans operates 13 Park and Ride lots in the county, providing more than 660 spaces. These spaces are primarily used as staging areas for cars and vanpools. Caltrans operates one Park and Ride lot in the study area along Blum Road, immediately north of the I-680/SR-4 interchange. A majority of the commuters who use this lot travel southbound on I-680, according to a July 2003 CCTA survey. The survey also indicated that most of the commuters use the lot and carpool five times per week.

2.14.3 Permanent Impacts

2.14.3.1 Household Impacts

The proposed project would involve relocating utility lines along SR-4 and Berry Drive. Due to the large diameter of a sanitary sewer line that would have to be moved and the limited right-of-way, approximately 365 meters (1,200 feet) of sewer line would be relocated close to the adjacent mobile home community, the Concord Cascade Mobile Home Park. This option would require a 70-meter (230-foot) easement and acquisition of property encompassing five to seven mobile homes (see Table 2.14-2 and Figure 2.14-2). Alternative options were also considered. However, because of the large diameter of the sanitary sewer line, a different design alternative would have required that the utility line be rerouted around the perimeter of the mobile home community, adjacent to Buchanan Field Airport. This option was deemed both impractical and cost prohibitive.

Based on current real estate information for Central Contra Costa County, there appear to be sufficient single-family homes for sale and rent to relocate the affected households. A survey of mobile home listings in November 2002 indicated that a sufficient number of mobile homes are available for sale, including homes within the Concord Cascade Mobile Home Park community. The State relocation assistance services and payment program would accommodate any impacts due to relocation. A summary of relocation benefits is provided in Appendix D.

2.14.3.2 Commercial Impacts

One auto accessory business, Campways Truck Accessory World at 4999 Pacheco Boulevard, could be displaced if the slip ramp is built. The property would be required for the relocation of Blum Road. While this business primarily serves local clientele, Campways Truck Accessory World stores can be found at multiple locations in Northern California. Commercial properties are available in the Study Region for the relocation of the affected business.

A second business would be impacted in the study area. A Pacheco Mini Storage and U-Haul facility located at 5146 Pacheco Boulevard is currently operated on land owned by Caltrans. The lease has a 2-year term and will expire before project construction would commence. Therefore, although the current business would be displaced, no relocation is anticipated per the terms of the lease.

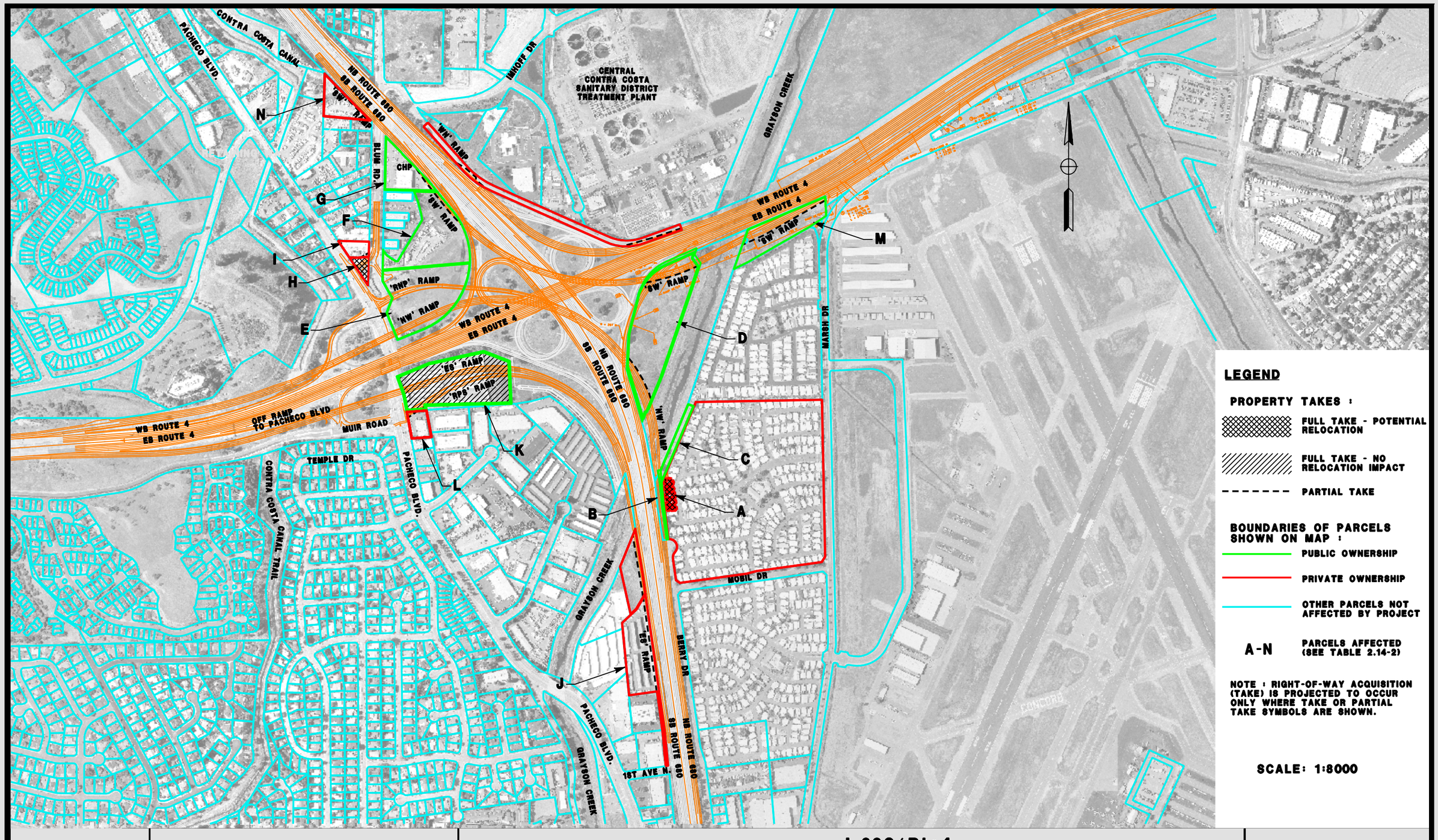
The proposed project could impact the parking areas of three parcels. Acquisition of a portion of a parcel, or "partial take," would be necessary on the northwestern corner of the parcel of an auto parts business located at 5166 Pacheco Boulevard and would impact approximately three customer parking spaces. Additional parking in front of the store would not be affected; however, the loss of a few parking spaces would likely have some economic impact for the business. Another potential parking impact may occur at 4961 Pacheco Boulevard, a large recreational vehicle (RV) storage yard. Moving an existing retaining wall from I-680 may impact some spaces for parked RVs. However, the impact and its magnitude would depend on the design features of the retaining wall. Finally, some parking spaces for California Highway Patrol vehicles located along I-680 at 5001 Blum Road may be eliminated with the highway improvements planned for I-680. Caltrans has consulted with the CHP regarding these impacts, which are not likely to be substantial.

Each of these commercial impacts are shown in Figure 2.14-2 and described in Table 2.14-2. Table 2.14-2 identifies how the parcels are impacted with respect to each project phase and whether the slip ramps affect the parcels listed.

2.14.3.3 Environmental Justice

Regulatory Setting

All projects involving a federal action (funding, permit, or land) must comply with Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, signed by President Clinton on February 11, 1994. This Executive Order directs federal agencies to take the appropriate



LEGEND

PROPERTY TAKES :

- FULL TAKE - POTENTIAL RELOCATION
- FULL TAKE - NO RELOCATION IMPACT
- PARTIAL TAKE

BOUNDARIES OF PARCELS SHOWN ON MAP :

- PUBLIC OWNERSHIP
- PRIVATE OWNERSHIP
- OTHER PARCELS NOT AFFECTED BY PROJECT

A-N PARCELS AFFECTED (SEE TABLE 2.14-2)

NOTE : RIGHT-OF-WAY ACQUISITION (TAKE) IS PROJECTED TO OCCUR ONLY WHERE TAKE OR PARTIAL TAKE SYMBOLS ARE SHOWN.

SCALE: 1:8000

URS 1333 BROADWAY, SUITE 800 OAKLAND, CA. 94612	Contra Costa Transportation Authority	I-680/Rte4 Project Area Resources Potentially Affected	Figure 2.14-2

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Table 2.14-2 Properties Potentially Impacted by the I-680/SR-4 Interchange Project Right-of-Way

Property	APN#	Street Address	Land Use Designation	Current Property Use	Impact Description	Affected by Slip Ramps?	Phase
A	125-020-058	245 Aria Drive	Residential	Concord Cascade Mobile Home Park	5-7 homes alongside highway likely relocated due to utility line displacement	No	1
B	125-020-040	NO ADDRESS	Commercial	Vacant (Narrow road), west border of A	Full take to move utility line	No	1
C	125-020-056	NO ADDRESS	Commercial	Shown as vacant public lot adjacent to mobile home park and north of B	Partial take; no effect to residents or businesses	No	1
D	125-020-043	Arnold Industrial Way	Commercial	Vacant	Possibly partial takes, either side; no effects	No	1, 4
E	159-150-011	Arnold Industrial Way	Commercial Responsibility	Park & Ride Lot and some temporary buildings near the highway	Parcel is affected by Phase 1 ramp, and parking area is crossed by slip ramp. The parking area will be modified to compensate for construction impacts.	Yes	1
F	159-150-032	5041 Blum Rd.	Commercial	Business - B&D Trailers and Wells Cargo RVs	Partial take on property's eastern edge – no commercial impact anticipated	No	1
G	159-150-021	5001 Blum Rd.	Commercial	CHP office and lot	Partial take in eastern side lot along highway – possible parking impact	No	1
H	159-210-024	4999 Pacheco Blvd.	Garage	Business - Campways Truck Accessory World	Full take; relocation would occur due to northbound I-680 to westbound SR-4 slip ramp	Yes	1
I	159-210-041	5036 Blum Rd.	Garage	Business - The Bug Stop – Auto Repair (Service and Sales)	Small partial take on SE corner with northbound I-680 to westbound SR-4 slip ramp – no business impact	Yes	1
J	125-240-029	95 N. First Avenue	Commercial	Business - Mini Warehouse / Public Storage	Partial take along eastern property border with southbound I-680 may affect structures	No	2
K	125-220-021	5146 Pacheco Blvd.	Commercial Mini-Storage	Business - Pacheco Mini Storage & U-Haul storage units	Full take of Caltrans-owned property with westbound SR-4 to southbound I-680 connector; private lease will expire.	No (Caltrans parcel; lease will expire)	2
L	125-220-002	5166 Pacheco Blvd.	Commercial Store	Business - Monument Car Parts	Partial take of NW corner of property – potential commercial parking impact	Yes	2
M	125-020-055	Arnold Industrial Way	Commercial	Vacant	Partial take; no impact	No	4
N	159-210-032	4961 Pacheco Blvd.	Commercial	Business - Hardcastle's RV Center - RV Storage Yard	Retaining wall will be built to mitigate any impacts to eastern property boundary with southbound I-680	No	4

and necessary steps to identify and address disproportionately high and adverse effects of federal projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law. Low income is defined based on the Department of Health and Human Services poverty guidelines. For 2008, this was $21,200 for a family of four.[15]

All considerations under Title VI of the Civil Rights Act of 1964 and related statutes have also been included in this project. The Department's commitment to upholding the mandates of Title VI is evidenced by its Title VI Policy Statement, signed by the Director, which can be found in Appendix G of this document.

Impacts

A minority community is defined as a distinct population composed of *predominantly* one or more racial or ethnic group(s) that is nonwhite. Table 2.14-3 lists the racial/ethnic population breakdown for each Census tract and indicates that the study area population is predominantly white (over 70 percent of the population in each of the four Census tracts). Census tracts are further subdivided into "block groups" and "blocks," and data for the blocks within residential areas bordering I-680 and SR-4 are listed in Table 2.14-4. This more detailed geographic population listed by block area also indicates that total nonwhite populations by block area are all below the county average of 34.5 percent and there are no predominantly nonwhite racial or ethnic groups bordering the project.

The average household income in the study area exceeds the Department of Health and Human Services low-income threshold (see Table 2.14-1). Poverty levels are generally below the regional average in CT 3200.02 and CT 3211.01 but higher than the regional averages in both CT 3212 and CT 3270. No Census data on income are available for the specific blocks in residential areas bordering the project, only for block groups. Table 2.14-5 identifies the percentage of the population of each block group bordering the project with incomes below the poverty level.

Three block groups bordering the project area have higher percentages of the population living below the poverty level than Contra Costa County as a whole: CT 3212, block group 1 (13.8 percent); CT 3270, block group 1 (10.1 percent); and CT 3270, block group 5 (12.1 percent). Project-related impacts to these block groups can be characterized as follows.

[15] The Census data are from 2000, at which time the poverty income level was $17,050 for a family of four.

Table 2.14-3 Racial/Ethnic Composition of the Study Area by Census Tract, 2000

Racial Group	Contra Costa County	CT 3200.02	CT 3211.01	CT 3212	CT 3270
Total Population	948,816	8,225	6,526	5,249	6,963
White	621,490 (65.5)*	6,525 (79.3%)*	5,244 (80.4%)*	3,809 (72.6%)*	5,037 (72.3%)*
African American	88,813 (9.4%)*	202 (2.5%)*	239 (3.7%)*	176 (3.4%)*	239 (3.4%)*
American Indian and Alaskan Native	5,830 (0.6%)*	67 (0.8%)*	44 (0.7%)*	30 (0.6%)*	96 (1.4%)*
Asian	103,993 (11%)*	764 (9.3%)*	461 (7.1%)*	782 (14.9%)*	418 (6.0%)*
Native Hawaiian or Other Pacific Islander	3,466 (0.4%)*	17 (0.2%)*	21 (0.3%)*	12 (0.2%)*	62 (0.9%)*
Other Race	76,510 (8.1%)*	263 (3.2%)*	213 (3.3%)*	139 (2.6%)*	768 (11%)*
Two or More Races	48,714 (5.1%)*	387 (4.7%)*	304 (4.7%)*	301 (5.7%)*	343 (4.9%)*
Hispanic or Latino (of any race)	167,776 (17.7%)*	827 (10.1%)*	677 (10.4%)*	569 (10.8%)*	1,660 (23.8%)*

Source: U.S. Census 2000, http://factfinder.census.gov
* Percentage of total population represented

Table 2.14-4 Racial/Ethnic Composition of Residential Areas by Blocks Bordering the Project, 2000

Census Tract	Block Group	Block	Total House-holds	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race	Two or more races	Percent Nonwhite
3200.02	2	2017	6	6	0	0	0	0	0	0	0
		2018	4	4	0	0	0	0	0	0	0
		2020	15	12	0	0	2	0	0	1	20
		2027	221	188	2	1	17	0	3	10	15
		2028	0	0	0	0	0	0	0	0	0
		2029	18	13	1	1	3	0	0	0	27
3211.01	2	2000	0	0	0	0	0	0	0	0	0
		2001	51	47	0	0	2	0	1	1	8
		2003	117	99	2	2	10	1	1	2	15
		2008	27	24	0	1	1	0	0	1	11
	3	3000	0	0	0	0	0	0	0	0	0
3212	1	1000	0	0	0	0	0	0	0	0	0
		1001	0	0	0	0	0	0	0	0	0
		1002	66	56	2	0	3	0	1	4	15
		1003	16	15	0	0	0	0	1	0	6
3270	5	5001	170	165	0	1	0	0	3	1	3
		5002	0	0	0	0	0	0	0	0	0

Source: Census 2000 Summary File 1 (SF 1) 100-Percent Data, Table H6
Note: Census data were not available for CT 3200.02, Block Group 2, Block 2033, or CT 3270, Block Group 1, Block 1050.

Table 2.14-5 Residents with Incomes Below the Poverty Level in Block Groups Bordering the Project, 2000

Census Tract	Block Group	Block Group Population	Block Group Population Below Poverty Level	Block Group Population Below Poverty Level (%)
3200.02	2	5054	258	5.1%
3211.01	2	1333	28	2.1%
	3	1658	0	0%
3212	1	1569	217	13.8%
3270	1	2101	212	10.1%
	5	828	100	12.1%

Source: Census 2000 Summary File 3 (SF 3) - Sample Data, Table P87

- CT 3212, block group 1 is bordered by Carolos Drive, Pacheco Boulevard, Brown Drive, and Temple Drive. The project would not relocate residences in this area. Future noise levels with the new northbound I-680 to westbound SR-4 ramp in place were predicted at 60 dBA, a slight decrease from existing noise levels. At the existing eastbound on- and off-ramps at Pacheco Boulevard near Temple Drive, traffic noise would remain similar to existing levels, which are below the criteria for consideration of abatement measures such as soundwalls. The project would not result in direct or indirect impacts to CT 3212, block group 1.

- CT 3270, block group 1 is bordered by SR-4, SR-242, Olivera Road, and Solano Way. The project would not relocate residences in this area. Phase 4 of the project includes a 14-foot-high soundwall (SW8; see Section 2.4.4.2 and Appendix A, Figure A-6) along the edge of eastbound SR-4 and the Arnold Industrial Way on-ramp. The soundwall would provide at least 5 dBA reduction at 15 to 20 residences at the mobile home park at the intersection of Peralta Road and Arnold Industrial Way. With this noise abatement measure in place, the project would improve noise conditions within the block group area.

- CT 3270, block group 5 is bordered by SR-4, Marsh Drive, Mobile Drive, Berry Drive, and I-680. All residential acquisitions for the project would be within CT 3270, block group 5, block 5001, which is in the mobile home park east of I-680. The noticing for the public meeting and availability of the IS/EA included communities most affected by the project, including the residents along the freeways within the blocks identified in Table 2.14.4. One of the informational meetings was noticed and held in the mobile home park in block 5001. Comments received

included mobile home park residents concerned with relocation and noise impacts. Potentially relocated residents were provided specific information on rights and benefits as well as contact information for Caltrans and county relocation specialists. As specific phases of the project are advanced, additional meetings will be held. More information on the public noticing and meetings is included in Chapter 3.

CT 3270, block group 5 is separated from the freeway by a soundwall that will be replaced with the project (SW7; see Section 2.4.4.2 and Appendix A, Figure A-4). Depending on the ultimate configuration, the new 14-foot-high soundwall would achieve at least a 5 dBA reduction in traffic noise for between eight and 22 residences in the mobile home park. With this noise abatement measure in place, no additional noise impacts would occur.

In summary, the Census data indicate that minority communities would not be disproportionately affected by the proposed project, either at the Census Tract level or at the more localized block group aggregation. Although five to seven mobile homes in an area with a higher poverty rate than the county average (CT 3270, block group 5, block 5001) would require relocation, residents would be eligible for relocation assistance, and adequate replacement housing is available in the project area (see Section 2.14.3.1). Therefore, the project would not result in disproportionately high and adverse effects to minority or low-income populations.

2.14.4 Community Character and Cohesion

2.14.4.1 Regulatory Setting

NEPA established that the federal government use all practicable means to ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings (42 USC 4331[b][2]). The Federal Highway Administration in its implementation of NEPA (23 USC 109[h]) directs that final decisions regarding projects are to be made in the best overall public interest. This requires taking into account adverse environmental impacts, such as, destruction or disruption of human-made resources, community cohesion and the availability of public facilities and services.

Under the California Environmental Quality Act, an economic or social change by itself is not to be considered a significant effect on the environment. However, if a social or economic change is related to a physical change, then social or economic change may be considered in determining whether the physical change is significant. Since this project would result in physical change to the environment, it is appropriate

to consider changes to community character and cohesion in assessing the significance of the project's effects.

2.14.4.2 Affected Environment

The study area assessed for community impacts is shown in Figure 2.14-1. Community demographics and facilities are discussed in Sections 2.14.1 and 2.14.2, respectively. Section 2.14.3 discusses potential project impacts to residences and businesses in the study area.

2.14.4.3 Impacts

The proposed project would not change existing community boundaries or divide neighborhoods. Although Blum Road would be relocated for the project, the realignment would occur in a commercial/industrial area and would not affect residential neighborhoods or increase urbanization in the study area. The realignment would not decrease public access to existing properties.

2.14.5 Employment and Unemployment

The relocation of an auto accessory business on Pacheco Boulevard is likely to have a minimal impact on employment. The business is small, with few employees, and has other locations in Northern California. Any impacts to overall employment in the area are likely to be small and short-lived. Commercial properties are available in the Study Region for the relocation of the affected business.

The closure of Pacheco Mini Storage and U-Haul on Pacheco Boulevard is not likely to have unanticipated adverse impacts on employment within the community. The facility is currently operated on land owned by Caltrans. The lease has a 2-year term and will expire before project construction would commence. Although the business would be displaced, the closure is anticipated and the lease will not be renewed.

2.14.6 Construction and Other Temporary Impacts

Certain areas of the Park and Ride lot on Blum Road would be blocked off during various phases of project construction, but proper construction staging should keep this to a minimum. Most public parking would be maintained through the project, with an ultimate increase in parking spaces in the second half of Phase 1.

The creeks would be temporarily impacted due to footing construction of the large bridge columns and some utility relocation. Construction noise will occur, including from activities such as pile driving. Traffic would be detoured throughout

construction due to the relocation of utilities, construction of bridges, highway widening, and other activities. Nighttime closures of highways and streets can be expected due to bridge falsework erection and installation of sign bridges. Other traffic detouring and delays can be expected.

2.14.7 Mitigation and Avoidance Measures

Relocation assistance payments and counseling will be provided to persons and businesses in accordance with the Federal Uniform Relocation Assistance and Real Properties Acquisition Policies Act, as amended, to ensure adequate relocation and a decent, safe, and sanitary home for displaced residents. All eligible displacees will be entitled to moving expenses. All benefits and services will be provided equitably to all residential and business relocatees without regard to race, color, religion, age, national origins and disability as specified under Title VI of the Civil Rights Act of 1964.

Mitigation measures for the loss of homes and an area business would be adopted and finalized by CCTA and Caltrans. Appropriate mitigation may involve compensation for the cost of comparable units in the vicinity. Displacees would also be entitled to moving expenses. The Caltrans Relocation Assistance Program, as established by Federal and State law, would provide relocation assistance to the displacees. To the extent possible, the aim will be to relocate households and the commercial property as close to the existing locations as possible.

A limited loss of property may be required within the existing parking areas for up to two area businesses and the California Highway Patrol, but business operations would not be affected. Public parking would be maintained throughout the project vicinity. While areas of the Caltrans Park and Ride lot may be affected by project construction, steps would be taken during the project construction phases to ensure that a net loss of parking is avoided. Any portions of the property impacted by construction would be fenced off and include appropriate signage. Circulation and access in the area would also be maintained.

2.15 Utilities and Emergency Services

2.15.1 Affected Environment

2.15.1.1 Utilities

Utilities in the project area include natural gas and electricity (Pacific Gas and Electric Company [PG&E]), telephone (SBC), sewer system (Central Contra Costa Sanitary District [CCCSD] and Mt. View Sanitary District), solid waste (Contra Costa County

and the City of Martinez), and water (Contra Costa Water District [CCWD]). Petroleum lines are owned by Santa Fe Pacific and Tosco. Utility easements are located within the immediate project vicinity. The study area for affected utilities consists of the four census tracts affected by the project (Table 2.14-1).

2.15.1.2 Law Enforcement

Public safety services are divided by city/county jurisdiction. All unincorporated areas within the study area are served by the Contra Costa County Sheriff's Department. The Sheriff's Department is responsible for the county portions of the study area, and the City of Martinez Police Department is responsible for the city portions. The CHP has statewide enforcement authority on county and State highways.

The Sheriff's Department has an office on Muir Road west of the I-680/SR-4 interchange. Sheriff's officers can access SR-4 from Muir Road at the on- and off-ramps located just west of Pacheco Boulevard and at the Morello Avenue/SR-4 interchange west of the project. The CHP office is located off of Blum Road, adjacent to southbound I-680 on the north side of the interchange. CHP officers can access the freeway system by taking Blum Road to Pacheco Boulevard and using the existing ramps at Pacheco Boulevard, located on the north and south sides of SR-4, to enter the freeway. The next-nearest access ramps to the freeways are at Concord Avenue to the south and at Pacheco Boulevard to the north of the BNSF railroad crossing.

2.15.1.3 Fire Protection

No fire stations are located in the study area. The Contra Costa County Fire Department's Stations 9 and 13 serve the study area. Station 9, which provides services to all of Pacheco and part of Vine Hill, is located at 209 Center Avenue in Pacheco. Station 13 provides service to the rest of Vine Hill and northeastern Martinez.

2.15.1.4 Hospitals

Three area hospitals have been identified: Contra Costa Regional Medical Center, located at 2500 Alhambra Avenue in Martinez; Kaiser Foundation Hospital at 200 Muir Road in Pacheco; and the Mount Diablo Medical Center at 2540 East Street in Concord.

2.15.2 Permanent Impacts

The proposed project would call for the movement of utility lines along SR-4 and Berry Drive, including an 84-inch-diameter sanitary sewer line, gas, and electric lines. Due to the large diameter of the sanitary sewer line and the limited right-of-way, approximately 365 meters (1,200 feet) of the sanitary sewer line would have to

be relocated very close to the adjacent mobile home community, the Concord Cascade Mobile Home Park. The relocation of the utility lines would not cause any change in service or accessibility to the local service area.

In addition to the 84-inch-diameter sanitary sewer line, the following sanitary and water pipelines would be affected by the project.

- Phase 1 – Three perpendicular 12-inch-diameter sanitary sewer line crossings of I-680 may need to be extended/protected. The project has the potential to impact a 12-inch water pipeline west of the I-680/SR-4 interchange and a 30-inch water pipeline south of the interchange.
- Phase 2 – Approximately 1,400 feet of an 8-inch-diameter sanitary sewer line on the west side of I-680 would need to be relocated; two 12-inch-diameter sanitary sewer crossings of I-680 may need to be relocated; and a 6-inch-diameter sanitary sewer line at the Muir Road/Pacheco Boulevard intersection may need to be extended/protected. The project has the potential to impact the same water pipelines as noted for Phase 1.
- Phase 3 – The project has the potential to impact a 12-inch-diameter water pipeline west of the interchange and 18- and 30-inch-diameter water pipelines east of the interchange. No impacts to sanitary sewer facilities were identified.
- Phase 4 – Ninety-inch, 39-inch, twin 78-inch, and 18-inch-diameter sanitary sewer lines would need to be protected near/beneath SR-4, between I-680 and the Walnut Creek channel. The project has the potential to impact an 18-inch-diameter water pipeline north of the interchange and 18- and 30-inch-diameter water pipelines east of the interchange.
- Phase 5 – Ninety-inch, 39-inch, twin 78-inch, 18-inch, and 8-inch-diameter sanitary sewer lines would need to be protected near/beneath SR-4, between I-680 and the Walnut Creek channel. CCCSD could lose the use of some of the frontage road along the westbound SR-4 on-ramp to northbound I-680 next to CCCSD's wastewater treatment plant primary tanks, which would affect secondary access to the plant and parking for 10 to 20 employees. CCCSD reports that any plan changes that require more property to the north could significantly affect plant operations. The project has the potential to impact an 18-inch-diameter water pipeline north of the interchange and 18- and 30-inch water pipelines east of the interchange.

CCWD noted in comments on the IS/EA that other water facilities or land rights may be impacted by the project, and requested to review the design drawings for each phase of work. In addition, CCWD stated that all five project phases have the potential to impact the Contra Costa Canal.

As noted in Section 2.15.1.2, the CHP has an office off of Blum Road and the Contra Costa County Sheriff has an office on Muir Road. Both law enforcement agencies use the existing ramps from Pacheco Boulevard and Muir Road to access SR-4 and I-680. With the installation of the I-680/SR-4 connectors under Phases 1 and 2, freeway access would remain the same except for the elimination of the northbound I-680 to SR-4 loop ramp and the eastbound SR-4 to southbound I-680 diagonal ramp. Slip ramps proposed for Phases 1 and 2 and conceptually approved by FHWA would maintain access between the freeway system and Pacheco Boulevard for these two directional movements, although the on- and off-ramps would provide access to and from the direct connectors to I-680 instead of SR-4. Phases 1 and 2 without slip ramps would change access between northbound I-680 and Pacheco Boulevard and between the Muir Road/Pacheco Boulevard area and southbound I-680. CHP and Sheriff's officers could still use Pacheco Boulevard to reach the Concord Avenue/I-680 interchange or Muir Road to reach the Morello Avenue/SR-4 interchange, but the greater travel distance would increase their response time.

2.15.3 Temporary Impacts

During construction, no utility and emergency services would be interrupted. All service impacts would be avoided.

2.15.4 Mitigation Measures

The contractor would notify emergency service providers of the proposed dates of the construction of the overall project work and utility relocation work. Coordination with local utility service providers will take place during engineering design development (the PS&E phase).

Prior to awarding construction contracts for any of the proposed project phases, Caltrans and/or CCTA will coordinate with CCCSD and CCWD to identify facilities or pipelines in the vicinity of the project, and work with the districts to provide assurance that their facilities will not be impacted or will be relocated accordingly.

2.16 Traffic and Transportation

2.16.1 Affected Environment

The existing I-680/SR-4 interchange provides important connections between Contra Costa County's regional freeway networks and provides access between the freeway system and important local roads. Figure 1-2 shows the network of roadways, which are summarized below.

- **I-680** is a north-south freeway through central Contra Costa County, connecting I-80 at Cordelia to the north with Interstates 101 and 280 in San Jose to the south. Within the project area, I-680 has six free-flow lanes in each direction. In 2003, construction began on the southbound Marina Vista to North Main Street segment and the northbound SR-242 to Marina Vista segment to add an additional lane in the median that will be designated for HOV use.
- **SR-4** is an east-west freeway connecting I-80 at the City of Hercules to the west with SR-160 and the City of Oakley to the east. SR-4 has two mixed-flow lanes in each direction through the I-680 interchange area, widening to three mixed-flow lanes in each direction west of the Pacheco Boulevard ramps. The CCTA 2004 Countywide Transportation Plan proposes adding a mixed-flow lane in each direction on SR-4 between SR-242 and Morello Avenue (2001 RTP, ID # 21079.) In addition, the 2001 RTP (ID # 21033) calls for HOV lanes between the I-680/SR-4 interchange and the SR-4 /SR-242 interchange.
- **Pacheco Boulevard** is a north-south arterial east of and parallel to I-680. It extends from Martinez to the City of Pleasant Hill, where it becomes Contra Costa Boulevard at its intersection with Concord Avenue. Connecting on-and off-ramps between SR-4 and Pacheco Boulevard are located to the west of I-680. Pacheco Boulevard is one lane in each direction north of SR-4 and two through-lanes south of SR-4.
- **Arnold Drive** is an east-west collector road parallel and to the north of SR-4, extending between Howe Road to the west and Pacheco Boulevard to the east. It is one lane in each direction.
- **Muir Road** is an east-west collector road parallel to and south of SR-4, extending between Center Avenue in the west and Pacheco Boulevard to the east. Muir Road is one lane in each direction.

Although this project emphasizes the regional problems and importance at the I-680 and SR-4 connections, the Pacheco Boulevard interchange to the immediate west of I-680 has been identified by local concerns as an important regional freeway access point. Hook ramps provide on and off access between SR-4 and Pacheco Boulevard. Within the project area, Pacheco Boulevard serves a mix of local businesses in the unincorporated portion of the county. The next closest connection to a regional freeway is near Arthur Road to the north and near Chilpancingo Parkway to the south. In addition to business and commercial freeway access, the Pacheco Boulevard ramps are used by the California Highway Patrol and the County Sheriff to enter the freeway from the regional facility on Blum Road. There is also a Park and Ride lot on Blum Road, and a survey of users indicates that the users originate from within and outside the county, and use the Pacheco Boulevard ramps.

Traffic analyses express operating conditions using a number of different parameters, but level of service is the most common. Level of service, or LOS, expresses how well a roadway or intersection is operating, based on the available capacity and the volume of predicted traffic. It is expressed in a scale of A to F, with A being the best or free-flow conditions. Predicted LOS for most of the I-680 and SR-4 freeway and connecting ramps is D to F, indicating congested conditions and delays. As described in Section 1.2, especially poor operating conditions exist at the ramp junctions and at the relatively short weaving sections between on- and off-ramps, which cause backups of traffic onto the freeway mainline sections. Eastbound SR-4 to southbound I-680 also operates poorly, with most sections of the highway at LOS F. Existing and predicted traffic volumes are shown in Appendix I.

2.16.2 Permanent Impacts

The proposed project would improve the level of service at the majority of freeway mainline sections, weaving areas, and ramp merge and diverge sections. All ramp junctions operating at unacceptable service levels in the year 2030 No Project conditions would either improve to acceptable service levels or be replaced by the proposed freeway-to-freeway connectors. Since the proposed project would eliminate several existing bottlenecks, it would result in an increase in mainline freeway volumes, and some ramp merge/diverge locations would operate at worse service levels in 2030.

Table 2.16-1 compares the projected 2030 conditions for the No Project with the full project (all five phases complete), and with Phases 1 and 2 only. The table

summarizes a more detailed breakdown of traffic conditions evaluated by freeway section (included in Appendix I) and provides an overall comparison of the number of freeway segments and ramps that change LOS with and without the project. Under 2030 No Project conditions, 11 facilities during the AM peak hour and 10 facilities during the PM peak hour would operate at unacceptable LOS E or LOS F. The completion of Phases 1 and 2 would reduce the number of deficient facilities to eight during the AM peak hour and four during the PM peak hour, while the completion of the full project (all five phases) would reduce the number of deficient facilities to seven during the AM peak hour and three during the PM peak hour. Overall, constructing the full project will improve operating conditions and efficiency of the interchange.

Table 2.16-1 Comparison of LOS on Freeway Facilities

	2030 No Project		2030 Phase 1 and 2 Only		2030 Full Project	
	AM	PM	AM	PM	AM	PM
LOS C or better	24	23	22	24	26	24
LOS D	12	14	12	14	4	10
LOS E or F	11	10	8	4	7	3
Total	47	47	42	42	37	37

Source: Fehr & Peers 2005 (based on data from Table 15, Final Traffic Analysis Report)

Table 2.16-2 compares the percent volume served under the 2030 No Project, full project (all five phases complete), and Phases 1 and 2 only conditions. The future (no project) demand volume at this interchange will be higher than the capacity of traffic that it can serve, and therefore the traffic model predicts that some vehicles will divert elsewhere or otherwise not will use the interchange during the peak period. The percent volume served represents the portion of vehicles that are able to use the interchange within its capacity. If the interchange is improved, capacity is increased and a higher volume of traffic can be served during the peak hour. Table 2.16-2 indicates the ratio between the total demand volume and the total served volume on all four approaches of the interchange. Bottlenecks primarily on southbound I-680 and westbound SR-4 during the AM peak hour and on northbound I-680 and eastbound SR-4 during the PM peak hour would accommodate about 90 percent of expected demand volume during the AM peak hour and 85 percent of expected demand volume during the PM peak hour. Phases 1 and 2 would improve some of these bottlenecks and increase the percent volume served to 93 percent during the

AM peak hour and 91 percent during the PM peak hour. The completion of the full project would eliminate all bottlenecks and allow 100 percent of traffic to be served during both AM and PM peak hours.

Table 2.16-2 Comparison of Percent Volume Served

Peak Hour	2030 No Project	2030 Phase 1 and 2 Only	2030 Full Project
AM	90%	93%	100%
PM	85%	91%	100%

Source: Fehr & Peers 2005 (based on data from Final Traffic Analysis Report)

The changes to local streets where pedestrian facilities exist or are appropriate are limited to the areas at or near Blum Road, Berry Drive, Muir Road, Pacheco Boulevard, and Grayson Creek. All modified pedestrian facilities will comply with the Americans with Disabilities Act (ADA). The project primarily involves freeway facilities, and no bicycle improvements are proposed. The project will include the following pedestrian facilities:

- Blum Road/Pacheco Boulevard intersection – Sidewalks will be added on Pacheco Boulevard and Blum Road. A crosswalk will be added between Blum Road and Pacheco Boulevard, and between Blum Road and the proposed Pacheco Transit Hub.
- Berry Drive – A proposed retaining wall will require relocation of the soundwall and replacement of the sidewalk near the Grayson Creek access gate.
- Muir Road/eastbound SR-4 on-ramp – Add signalized intersection and maintain pedestrian crosswalks.
- Pacheco Boulevard/southbound I-680 slip ramp – Intersection will be signalized with a crosswalk at the slip ramp.

2.16.3 Temporary Impacts

Construction would result in some disruptions to traffic flow. A construction staging plan is developed for all highway improvement projects and will address temporary lane changes and traffic diversions. There is a potential for temporary increased delays during construction, and temporary diversions may have some impact to local traffic conditions.

2.16.4 Mitigation Measures

Construction of Phases 1 and 2 is anticipated over a 2-year period. Caltrans will require the contractor to include measures to avoid and minimize regional and local traffic disruption through notification of upcoming work and posting of detour or closure plans.

2.17 Visual/Aesthetics

Regulatory Setting

The National Environmental Policy Act of 1969 as amended (NEPA) establishes that the federal government use all practicable means to ensure all Americans safe, healthful, productive, and aesthetically (emphasis added) and culturally pleasing surroundings (42 U.S.C. 4331[b][2]). To further emphasize this point, the Federal Highway administration in its implementation of NEPA (23 U.S.C. 109[h]) directs that final decisions regarding projects are to be made in the best overall public interest taking into account adverse environmental impacts, including among others, the destruction or disruption of aesthetic values.

Likewise, the California Environmental Quality Act (CEQA) establishes that it is the policy of the state to take all action necessary to provide the people of the state "with…enjoyment of aesthetic, natural, scenic and historic environmental qualities." (CA Public Resources Code Section 21001[b]).

2.17.1 Methodology

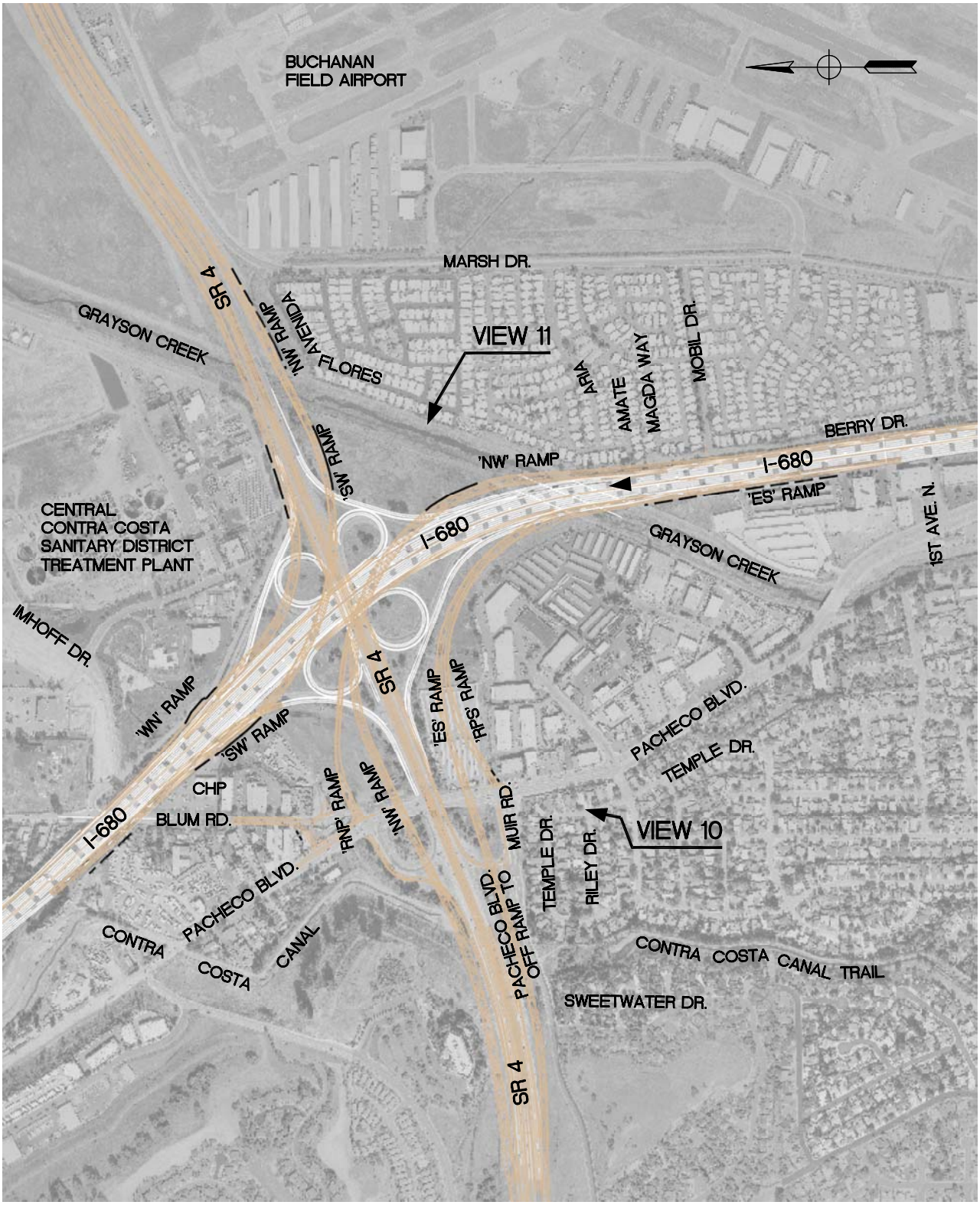
The viewsheds, or areas from which the proposed project would be visible to the public, were defined by review of the existing interchange to determine locations and distances from which the interchange can be seen. On-site evaluations were conducted on May 21 and October 10, 2002, and on January 11, 2003.

The visual environment was subsequently assessed for views from sensitive receptors (adjacent residential properties, public access trails, and a recreational park in the vicinity), representing a range of views of the interchange. Views from roadways (motorists' perspective) were also examined in assessing visual effects. From these vantage points, the visual character of the project area was assessed based on vividness (memorability of landscape components), intactness (visual integrity of landscape), and unity (visual coherence and compositional harmony). These criteria are set forth in the Visual Impact Assessment for Highway Projects (FHWA 1983). Viewer sensitivity was estimated based on the use of the viewshed.

Views within the project area are limited except at higher elevations and along roadway corridors. Views from more distant locations, such as the slopes of Mount Diablo and the hills to the west of the project, are relatively far away and the distant or noticeable details of the existing highway structures are not distinct. Fifteen locations were photographed and two Key Views were identified as relatively representative of the visual environment affected by the project. The first is a view from the intersection of Riley Drive and Temple Drive looking northeast toward eastbound SR-4 behind trees and residential structures (View #10). This view is dominated by one-story single-family residences, trees, shrubs, and utility poles and lines. The second Key View is from the levee facing northwest across the Grayson Creek flood control channel toward the I-680/SR-4 interchange (View #11). Views from this position are of the riparian corridor, grassy slopes across the channel, and trees/shrubs. The Key View locations and directions are shown in Figure 2.17-1. The two Key Views are shown in Figures 2.17-2 and 2.17-3.

2.17.2 Affected Environment

The I-680/SR-4-interchange is located on flat terrain above the San Ramon Valley. From the study area, Mount Diablo and its foothills are visible from a distance to the east, and Franklin Ridge and Briones Hills can be seen to the west. Mount Diablo and Franklin Ridge are the two most important scenic visual resources within the viewshed.



LEGEND:

▲ Views 10 and 11

	Project No. 26812934 I-680/SR 4 INTERCHANGE IMPROVEMENT PROJECT	LOCATION AND DIRECTION OF KEY VIEWS 10 AND 11	FIGURE 2.17-1

Jun 30, 2004 - 10:17am
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VIEW 10A: Existing View of Temple Drive to I-680/SR4 Interchange

VIEW 10B: Photosimulation of Proposed Project on Temple Drive

	Project No. 26812934 I-680/SR 4 INTERCHANGE IMPROVEMENT PROJECT	PHOTOSIMULATION OF KEY VIEW No.10	FIGURE 2.17-2

Jun 30, 2004 - 10:22am
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VIEW 11A: Existing View of I-680/SR4 Interchange from Avenida Flores Mobile Homes

VIEW 11B: Photosimulation of Proposed Project on I-680/SR4 Interchange from Avenida Flores Mobile Homes

	Project No. 26812934 I-680/SR 4 INTERCHANGE IMPROVEMENT PROJECT	PHOTOSIMULATION OF KEY VIEW No.11	FIGURE 2.17-3

Jun 30, 2004 - 10:26am
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The project area is a largely built environment dominated by various forms of urban structures, the interchange and Buchanan Field Airport being the most prominent. I-680 south of the interchange and SR-4 west of the interchange are heavily landscaped with trees and shrubs, while other parts of the highways in the study area are more rural with a combination of grassy slopes and occasional trees. Neither I-680 nor SR-4 is designated as a California Scenic Highway. However, portions of I-680 and SR-4 are classified as Landscaped Freeways.

The natural landscape has been altered over time in all of the surrounding flat terrain areas of the proposed project. With the exception of the distant regional hills, all vistas reveal introduced and mixed plant species that are planned individually for each commercial or residential property. Consequently, there is little overall existing unity or cohesion in terms of landscaping patterns.

Grayson Creek crosses I-680 and SR-4 in the southeast quadrant of the project site. Although it is a gated flood control channel and is not formally open to the public, access is achieved through individual mobile home properties that border the levee. The course of the channel runs parallel to the mobile home properties, crossing I-680 to the west. Contra Costa Canal follows I-680, crossing the BNSF Railroad and SR-4 at the Pacheco on- and off-ramps. Contra Costa Canal begins at Muir Road and follows the Canal southward. Users of the trail can see SR-4 where it intersects with Muir Road.

The visual characters of the two Key Views (View #10 and View #11) are rated as low and moderate-high, respectively. View #10 has low vividness with limited memorability, and low intactness because the integrity of the visual environment is fragmented by encroaching human structures (see Figure 2.17-2). View #10 also has a low unity rating as utility poles/lines and the view of the highway fragment the visual environment. In contrast, because of the natural elements in the urbanized environment, View #11 is rated moderate for vividness, moderate for intactness, and high for unity (Figure 2.17-3).

2.17.3 Permanent and Temporary Impacts

The proposed project would not result in substantial adverse visual impacts. Views within the project area are limited by urban structures and vegetation, except at higher elevations and through roadway corridors. Impacts that are expected to result from the proposed project are described in the following paragraphs.

During construction, which would last approximately 18–24 months per phase, viewers would generally see materials, equipment, workers, and the operations of construction equipment. Impacts of construction are unavoidable but would be temporary. Motorists and pedestrians would be exposed briefly to construction activities while passing through construction zones. Residents would be exposed on a more continuous basis. The installation of soundwalls during the early stages of construction would reduce both the noise and visual impacts to residents.

As a result of the construction planned during Phase 1 of the project, the loop ramp in the northeast quadrant of the interchange would be replaced with a new ramp connecting northbound I-680 to westbound SR-4 and the Pacheco Boulevard off-ramp. Motorists would see less of the pavement and more landscaped area where the loop ramp currently exists. In its place, the new Phase 1 connector would create an additional horizontal structure directly above the existing I-680 and SR-4 highway and overcrossing structures. This impact would not be substantial because from any vantage point the new structure would be visible by motorists for less than one second more than the current SR-4 overcrossing, and would not substantially impair existing views of the surrounding area.

Additional pavement may also be visible in areas where travel lanes transition to the ramp. From southbound I-680, the views of Mount Diablo, which are currently unobstructed, would be partially blocked for approximately four seconds, or slightly longer if a traffic delay occurred on southbound I-680. Motorists on the ramp connecting northbound I-680 with eastbound SR-4 will have elevated views of the surrounding terrain to the north and east. To the west, existing views of Grayson Creek below would be briefly blocked by a soundwall. A similar structure and effect would appear on the new northbound I-680 to westbound SR-4 ramp. Although other long range views may be briefly blocked, no substantial adverse effects are anticipated.

Mobile home residents on Avenida Flores (in the mobile home residential area in the southwest quadrant of the interchange) would have views of the northwest connector after the completion of Phase 1. Views of Franklin Ridge would also be partially blocked by the project (Figure 2.17-3).

Phase 2 construction would include removal of the diagonal connecting ramp in the southwest quadrant, addition of a ramp connecting eastbound SR-4 with southbound I-680, and the Pacheco Boulevard on-ramp to southbound I-680. Residents of the

Temple Drive neighborhood in the southwest quadrant of the interchange would be able to see the east-to-south connector ramp, which will appear above the existing terrain and may be seen beyond the roofs of residences in this neighborhood (Figure 2.17-2). Users of the Contra Costa Canal Trail, in the vicinity of its northern terminus at Muir Road, would see the southeast connector ramp when looking to the north/northeast (toward the existing highways). Where the structures for Phases 1 and 2 are visible, there would be potential glare and lighting impacts from visibility of the cars at night, and any potential safety lighting of the freeway ramps. While the original visual character of the view from these locations would be changed permanently, adverse visual impacts would be mitigated.

Figures A-1 through A-13 in Appendix A show the locations of soundwalls in the project area. Wherever a soundwall is ultimately installed, it would be constructed to maintain the design integrity of the surrounding area; however, the character of the view would change. Where space permits, shrubs and vines would be planted in front of the soundwalls to mitigate for the changes to the visual character of the area. In areas where vines or shrubs cannot be planted, the perceived visual impact would be reduced with the implementation of texture, color and pattern applied to the surface walls. The aesthetic treatment applied would be similar to existing walls within the corridor to provide a sense of unity and cohesiveness.

2.17.4 Mitigation Measures

The following measures are recommended for the proposed project. These measures would be developed in detail in landscaping plans for the project, during the project design phase.

- Design and place landscaping as plans for construction are completed, to blend the roadway improvements into the local community. Categories of landscaping have been initially identified at a conceptual level for the project right-of-way in the visual resources technical report. These categories identify general areas suitable for varying heights of ground cover and shrubs, trees, grasses and wildflowers (for erosion control), and vines (potentially for soundwalls). An actual planting design would be developed during the overall design stage of project planning. New and replacement planting will be carried out within State right-of-way in conformance with Caltrans standards for types of species, setback clearances, and maintenance criteria. Native plant species will be considered, including replacement of affected oaks listed in Section 2.7. The planting design

will conform to FAA standards for height restrictions in and around Buchanan Field Airport.

- Landscaping will be provided at Pacheco Boulevard in the vicinity of the slip ramps under a separate contract from the phased interchange improvements. Any landscaping adjacent to local streets, both inside and outside of State right-of-way, would be subject to approval of a permanent maintenance agreement between the local entity and the State.
- Slope rounding techniques would be utilized to integrate the structures into the landscape by sculpting the earth so that it follows the horizontal direction and the gradient of the slopes of the ramps, and by making the transitions from the flat areas to the slopes gradual in appearance.
- To avoid or minimize impacts on adjacent properties, retaining walls will be constructed. The walls' color and textures will match existing walls within the project limits.
- Limit and design lighting to minimize light intrusion into adjacent areas. Include landscaping, where space allows, to help screen lighting from vehicles to residential areas adjacent to the freeways.

Soundwalls are proposed for noise abatement purposes. Walls will be similar in design and treated with aesthetic finishes to be consistent with existing walls within the project limits and along the I-680/SR-4 corridor. Soundwalls and retaining walls will be reviewed during project development for installation of planting where adequate space is available and maintenance is feasible. Vine plantings at even intervals along the soundwalls would be planted as a minimum mitigation measure (where space allows) to reduce the walls' visual dominance and glare and to deter graffiti.

2.18 Cultural Resources

Regulatory Setting

"Cultural resources" as used in this document refers to all historical and archaeological resources, regardless of significance. Laws and regulations dealing with cultural resources include:

The National Historic Preservation Act of 1966 (NHPA), as amended, sets forth national policy and procedures regarding historic properties, defined as districts, sites, buildings, structures, and objects included in or eligible for the National Register of Historic Places. Section 106 of NHPA requires federal agencies to take into account

the effects of their undertakings on such properties and to allow the Advisory Council on Historic Preservation the opportunity to comment on those undertakings, following regulations issued by the Advisory Council on Historic Preservation (36 CFR 800). On January 1, 2004, a Section 106 Programmatic Agreement (PA) between the Advisory Council, FHWA, State Historic Preservation Officer (SHPO), and the Department went into effect for Department projects, both state and local, with FHWA involvement. The PA implements the Advisory Council's regulations, 36 CFR 800, streamlining the Section 106 process and delegating certain responsibilities to the Department. The FHWA's responsibilities under the PA have been assigned to the Department as part of the Surface Transportation Project Delivery Pilot Program (23 CFR 773) (July 1, 2007).

Historic properties may also be covered under Section 4(f) of the U.S. Department of Transportation Act, which regulates the "use" of land from historic properties. See Appendix L for specific information regarding Section 4(f).

Historical resources are considered under the California Environmental Quality Act (CEQA), as well as California Public Resources Code (PRC) Section 5024.1, which established the California Register of Historical Resources. PRC Section 5024 requires state agencies to identify and protect state-owned resources that meet National Register of Historic Places listing criteria. It further specifically requires the Department to inventory state-owned structures in its rights-of-way. Sections 5024(f) and 5024.5 require state agencies to provide notice to and consult with the SHPO before altering, transferring, relocating, or demolishing state-owned historical resources that are listed on or are eligible for inclusion in the National Register or are registered or eligible for registration as California Historical Landmarks.

2.18.1 Affected Environment

2.18.1.1 Historical Background

Early Historical Background

Formal ownership of lands in the Contra Costa County area began with Mexican government land grants for cattle operations in the early to mid 1800s. European settlement primarily occurred after the beginning of the California Gold Rush in 1848. The town of Pacheco was established in 1853 on lands purchased between Grayson and Walnut Creeks, and quickly became one of the busiest and more prosperous towns in the county. Traffic passed through Pacheco on the way to Martinez, and the then-navigable Pacheco Creek provided a water route for shipping

agricultural products. However, being in the confluence of Grayson and Walnut Creeks subjected Pacheco to severe flooding, ruining plowed fields and filling Pacheco Creek with silt. Many businesses relocated to the new town of Concord, built on higher ground, and Pacheco's importance as a shipping center ended by the close of the 19th century.

Commerce and Agriculture

Agriculture was the major economic base for the county during the 19th century. Early settlers harvested wild hay to support the large "rancho" livestock operations transitioned to cultivated grain production, particularly wheat. Both Martinez and Pacheco were major shipping points for California's Central Valley and Sacramento-San Joaquin River Delta wheat producers. Following the decline of the wheat industry in the late 1800s due to overproduction, farmers converted fields to orchards and vineyards, and much of the land in the project area was agricultural until the expansion of residential development primarily after World War II. Other early businesses in the Pacheco and Martinez area included the Contra Costa Gazette newspaper, hotels, and the Grand Casino.

Residential and Community Development

Although agricultural use continued to dominate into the Great Depression period, by the 1920s, landowners were beginning to sell agricultural lands to subdivision developers. During and following the war, families associated with the military increased the demand for housing. Subdivisions such as Beckett Acres, which is within this project's Area of Potential Effect (APE), is an example of the small residences and street patterns that typified these newly expanding suburbs of the Bay Area. These homes, built in the mid 1950s, represented single-family dwellings with relatively similar layout plans and construction. The overall increase in homes prompted the construction of community services such as the Pleasant Hill Shopping Center and Diablo Valley College.

Transportation

The project area's initial roadway network began with simple paved roads connecting Martinez and Pacheco, followed by the Arnold Industrial Highway, the predecessor to SR-4. Envisioned to connect agricultural and industrial uses, the highway opened to traffic in 1939. The original Arnold Industrial Highway portion of SR-4 (including through the project area) was upgraded in segments between 1967 and 1981. I-680 was initially completed in 1961 with four lanes in each direction, with a cloverleaf connection at SR-4.

Water Resource Infrastructure

Three water conveyance features are within the project's APE: Walnut and Grayson Creeks, and the Contra Costa Canal. The State Division of Highways designed SR-4 to cross through the lower floodplain of Walnut Creek and was concerned about flood risks. During construction in 1938 and 1939, a portion of Walnut Creek was channeled and the Walnut Creek Levee was constructed to help confine floodwaters. The Grayson Creek Levee was constructed sometime between 1947 and 1959 for the same purpose. The Contra Costa Canal is a component of the U.S. Bureau of Reclamation's Central Valley Project (CVP). The canal crosses the project's APE twice, once under I-680 in the northern portion of the APE and the other in the western extent of SR-4. The CVP was designed as a statewide system of canals, reservoirs, and transfer systems that would serve as a storage and distribution system. Construction of the overall system began in 1931 with emphasis on job creation under the New Deal program implemented by President Franklin D. Roosevelt. The CVP had five major components: the Shasta Dam, Delta-Mendota Canal, Friant Dam, Friant-Kern Canal, and the Contra Costa Canal. The 46-mile-long Contra Costa Canal was designed to deliver water to farms, industries, and homes in the Sacramento-San Joaquin River Delta and northern Contra Costa County. With a period of significance from 1937, the start of the original construction of the canal, to 1951, when permanent water supply contracts for water deliveries were signed, the canal has provided a necessary supply of freshwater to meet the growing municipal and industrial demand of an expanding Contra Costa County, while continuing to serve the region's diminishing agriculture economy. Its completion also essentially solved the problem of saltwater intrusion to groundwater resources in eastern Contra Costa. The Contra Costa Canal is of historic significance (at the State level) as an original and integral unit of the CVP and at the local level for its importance in the economic and industrial development of the eastern portion of the county.

2.18.1.2 Historical Resource Investigations

A study area, defined as the Architectural APE, was used to inventory and evaluate the potential significance of architectural or other built resources. The Architectural APE is summarized as follows, by interchange quadrant:

- SR-4 from Morello Avenue to Pacheco Boulevard: With a few exceptions, the Architectural APE includes properties one parcel back from Arnold Drive and Muir Road, expanding to include the entire Contra Costa Juvenile Hall facility.

- At the I-680 /SR-4 interchange: The APE includes all properties one parcel back from the State right-of-way, including surrounding the proposed changes at Pacheco Boulevard and Blum Road, and the mobile home park in the southeast quadrant. The APE excludes the CCCSD treatment plant in the northeast quadrant.
- SR-4 east of I-680: Work is generally limited to the median and therefore the Architectural APE follows the existing and proposed right-of-way limits.
- I-680 south of SR-4: Right-of-way acquisition is necessary, and the project will include new elevated flyover ramps that will be visible outside of the right-of-way. Therefore, the Architectural APE extends one parcel back from the State right-of-way.
- I-680 north of SR-4: The Architectural APE extends approximately one parcel back from the existing and proposed State right-of-way where the proposed ramps will be elevated, between SR-4 and approximately where I-680 crosses the Contra Costa Canal. North of the canal, the APE follows the existing State right-of-way.

Before field surveys were conducted, various listings of properties on the California Historic Resources Inventory System were reviewed for previous determinations of eligible or ineligible resources at the Federal, State, or local level. Historic context and site-specific research on individual properties was conducted at the California State Library; Shields Library at the University of California, Davis; the Caltrans headquarters library in Sacramento; the Caltrans District 4 Maps and Plans Office; the Contra Costa County Assessor's Office and Recorder's Office; and the county library. Personal interviews were also conducted. The Caltrans Historic Bridge Survey was reviewed. Background research was performed on building ages through real estate databases and review of area maps. Letters were sent to regional historical societies requesting information.

A survey was performed to account for all buildings and structures within the APE. This determined in part which buildings and structures were potentially over 45 years of age (i.e., constructed before 1957) or otherwise exhibited characteristics potentially meeting the criteria for listing in the NRHP or the California Register of Historic Resources (CRHR). Resources over 45 years of age were recorded individually with extensive field notes and individual photographs. Of the 170 parcels within the APE, 23 contained buildings or structures constructed before 1957. None of the properties

less than 45 years in the APE were recorded as they were determined to not exhibit features of exceptional significance required for further evaluation.

2.18.1.3 Historical Resources

One property within the APE has been determined eligible for listing in the NRHP. Eligibility requires that a resource have both integrity to a discrete period of significance and historical significance under one of four specific criteria. The Contra Costa Canal was determined to meet the criteria for listing in the NRHP at the State level under Criterion A for its association with "events that have made a significant contribution to the broad patterns of our history" and at the local level under Criterion A for its association with the development of eastern Contra Costa County. It is associated with the construction and operation of the CVP, and with the industrial and economic development of eastern Contra Costa County during the period of 1937 through 1951. Documentation of the SHPO's concurrence with this finding is provided in Appendix H.

No other buildings and structures within the APE were determined to meet the NRHP or CRHR criteria. None of the levees, highway bridges, and residential or nonresidential buildings was determined to qualify.

2.18.1.4 Permanent and Construction Impacts

The only property that meets the criteria for listing in the NRHP and CRHR is the Contra Costa Canal. Anticipated construction activities at the Contra Costa Canal are described in Section 1.3.2. This project's Historic Property Survey Report describes the findings and conclusions for the canal and concludes that the project would have no effect on historic properties. No part of the canal will be destroyed or damaged by the project. The two sections of the canal that pass beneath SR-4 and I-680 were already altered from their original condition by modernization of the two routes over the past 40 years. The proposed project will cause no additional change to the original condition of the canal at either location; rather, it will simply add modern sections to structures in the canal that have been previously altered and modernized.

No other properties affected by the project were determined to be eligible or partially eligible for listing in the NRHP or CRHR. No other adverse impacts to protected historic properties would occur from project phases.

2.18.2 Mitigation Measures

No adverse impacts to historic resources were identified.

2.19 Archaeological Resources

An archaeological survey report and historic property survey report were prepared for the proposed project to comply with the applicable sections of the National Historic Preservation Act and the implementing regulations of the Advisory Council on Historic Preservation. The following summarizes the reports and findings.

2.19.1 Affected Environment

2.19.1.1 Early Inhabitants

The earliest period of human occupation of the Bay Area is unknown, although evidence indicates presence in the greater regional area (e.g., as far north as Clear Lake) between 5,000 and 10,000 years ago. A precise chronology has not been established, and the cultural relationship of inhabitants of the Bay Area to more interior populations is not firmly known. However, the patterns of occupation have been generally grouped into three concepts: the Windmiller (approximately 4500 to 2,500 years ago, or early middle horizon), Berkeley (2,500 to 1,500 years ago, or middle horizon), and Augustine Patterns (1,500 to 150 years ago or late prehistoric). Each period typifies characteristics of the use of food sources, tools, burials, and artifact remains, and indicates patterns of occupation by people that established trade networks and generally collected, gathered, and hunted a wide variety of food.

2.19.1.2 Ethnography

The study area is located in the traditional territories of the Bay Miwok and the Costanoan peoples. Evidence suggests the ancestors of the Miwok settled in the vicinity of the project area during the Middle Horizon of California prehistory. The territory of the Bay Miwok (Saclan tribelet according to Levy 1978b or Tatcan tribelet according to Milliken 1995) stretched from Walnut Creek to the delta region of the Sacramento and San Joaquin rivers. Upon contact with the Spanish, the Bay Miwok were the first of the Eastern Miwok to have some members converted to Christianity. The word Costanoan was applied by the Spanish to the natives living along the coastal regions in the area, although eight languages were spoken among the Costanoans. In the project area, a single tribelet of Costanoans spoke Carquin/Karkin. Levy (1978a) suggests the ancestors of the Costanoans settled in the San Francisco Bay Area around A.D. 500.

Euroamerican contact with the Bay Miwok first occurred during a series of Spanish expeditions into the area between 1769 and 1776. By 1806 to 1810 most of the Indians from the inner Bay Area had already been baptized, and peoples who lived farther from

the missions began to experience the same events and processes that earlier caused the first migration to the missions, particularly famine and diseases such as measles and syphilis. The Mexican Period was marked by secularization as the Spanish-colonial mission system collapsed and their lands fell out of mission control. Many Costanoans and Miwok formed multiethnic communities around the Bay Area in an attempt to maintain some aspects of their traditional lifestyle. These communities gradually shrank in size. By 1845 most land holdings were within large ranchos.

2.19.1.3 Archaeological Investigations

An APE was also established for archaeological resources. Unlike the historic resources APE that considers properties outside of the project's proposed right-of-way, the archeological APE was defined to encompass areas that construction would occur, including areas where construction crews may use for temporary staging. Therefore, the archaeological APE covers the project's existing and proposed right-of-way and temporary construction areas that might be used by the contractor.

A search of pervious surveys and known records of sites was performed for areas in and surrounding the archaeological APE. These included a record search at the Northwest Information Center of the California Historical Resources Information Center at Sonoma State University. Seven previous surveys yielded negative findings, no archaeological sites were recorded within the APE, and two historic properties were identified within 1.6 km (1 mile). The previous survey results were reviewed prior to this project's field survey.

An intensive survey was conducted of the entire archeological APE by qualified archaeologists. No evidence of cultural materials was found.

2.19.1.4 Consultation

In addition to consulting the California Historical Resources Information Center for previous surveys and archaeological records, the Native American Heritage Commission was contacted. No sacred lands were identified in the project's APE, and a list of individuals and groups with potentially special knowledge of the project area was provided. Letters were sent to these groups and individuals. Those contacted had no additional information concerning potential sacred lands within the project area, but several individuals expressed interest in being contacted if resources are encountered during construction. One individual not identified by the Native American Heritage Commission wrote a letter expressing concern about a site located southeast of the interchange toward the Buchanan Field Airport vicinity, and

requested an investigation should disturbance of the site be necessary. The site is recorded as containing artifacts and a burial but is outside of the APE. No evidence of this site was observed during the archaeological survey for the project.

2.19.2 Permanent and Temporary Impacts

Review of previous records and the results of the archaeological survey of the project's archeological APE found no evidence of prehistoric or historic materials, evidence of archaeological deposits, or indications of occupation. No adverse impacts to these resources were identified.

2.19.3 Mitigation Measures

No further archaeological work is necessary within the current project APE. If, in the future, the project expands to include unsurveyed lands, then additional archaeological work may be necessary. Likewise, if cultural materials are encountered during ground-disturbing activity associated with this project, all work in the vicinity of the discovery must halt until a qualified archaeologist makes an assessment of the find and follows the proper protocol for the specific type of cultural material. Special note should be made regarding this stop work requirement in the area outside of the APE, southeast of the I-680/SR-4 interchange toward Buchanan Field Airport, consistent with the concern expressed about a known site in that area.

2.20 Climate Change

While climate change has been a concern since at least 1988, as evidenced by the establishment of the United Nations and World Meteorological Organization's Intergovernmental Panel on Climate Change (IPCC), the efforts devoted to greenhouse gas (GHG) emissions reduction and climate change research and policy have increased dramatically in recent years. In 2002, with the passage of Assembly Bill 1493 (AB 1493), California launched an innovative and pro-active approach to dealing with GHG emissions and climate change at the state level. AB 1493 requires the California Air Resources Board (CARB) to develop and implement regulations to reduce automobile and light truck GHG emissions; these regulations will apply to automobiles and light trucks beginning with the 2009 model year.

On June 1, 2005, Governor Arnold Schwarzenegger signed Executive Order S-3-05. The goal of this Executive Order is to reduce California's GHG emissions to: 1)

2000 levels by 2010, 2) 1990 levels by the 2020 and 3) 80 percent below the 1990 levels by the year 2050. In 2006, this goal was further reinforced with the passage of Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006. AB 32 sets the same overall GHG emissions reduction goals while further mandating that ARB create a plan, which includes market mechanisms, and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." Executive Order S-20-06 further directs state agencies to begin implementing AB 32, including the recommendations made by the state's Climate Action Team.

With Executive Order S-01-07, Governor Schwarzenegger set forth the low carbon fuel standard for California. Under this executive order, the carbon intensity of California's transportation fuels is to be reduced by at least 10 percent by 2020.

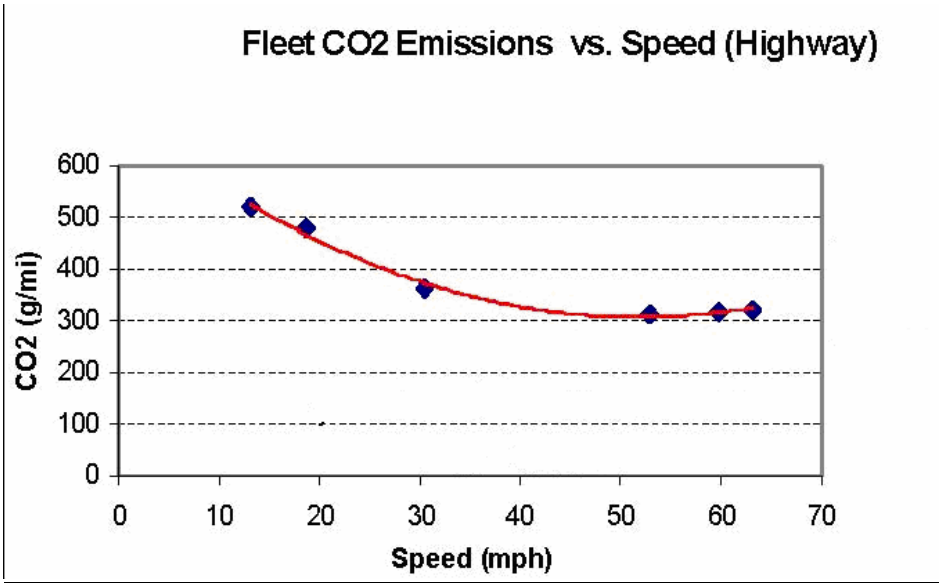
Climate change and GHG reduction is also a concern at the federal level; at this time, no legislation or regulations have been enacted specifically addressing GHG emissions reductions and climate change. However, California, in conjunction with several environmental organizations and several other states, sued to force the U.S. Environmental Protection Agency (EPA) to regulate GHGs as a pollutant under the Clean Air Act (Massachusetts vs. Environmental Protection Agency et al., U.S. Supreme Court No. 05–1120. 549 U.S. _____. Argued November 29, 2006—Decided April 2, 2007). The court ruled that GHGs do fit within the Clean Air Act's definition of a pollutant, and that EPA does have the authority to regulate GHGS. Despite the Supreme Court ruling, there are no promulgated federal regulations to date limiting greenhouse gas emissions.

According to a recent white paper by the Association of Environmental Professionals, "an individual project does not generate enough greenhouse gas emissions to significantly influence global climate change. Global climate change is a cumulative impact; a project participates in this potential impact through its incremental contribution combined with the cumulative increase of all other sources of greenhouse gases.

The Department and its parent agency, the Business, Transportation, and Housing Agency, have taken an active role in addressing GHG emission reduction and climate change. Recognizing that 98 percent of California's GHG emissions are from the burning of fossil fuels and 40 percent of all human made GHG emissions are from transportation, the Department has created and is implementing the Climate Action Program at Caltrans (December 2006). Transportation's contribution to GHG

emissions is dependent on 3 factors: the types of vehicles on the road, the type of fuel the vehicles use, and the time/distance the vehicles travel.

One of the main strategies in the Department's Climate Action Program to reduce GHG emissions is to make California's transportation system more efficient. The highest levels of carbon dioxide from mobile sources, such as automobiles, occur at stop-and-go speeds (0-25 miles per hour) and speeds over 55 mph; the most severe emissions occur from 0-25 miles per hour (see figure below). Relieving congestion by enhancing operations and improving travel times in high congestion travel corridors will lead to an overall reduction in GHG emissions.



Source: Center for Clean Air Policy— http://www.ccap.org/Presentations/Winkelman%20TRB%202004%20(1-13-04).pdf

The proposed project is intended to improve operational efficiency of the I-680/SR-4 interchange and reduce traffic congestion and delays. The project would improve the level of service (reduce delays) at the majority of ramp junctions and result in overall improvements to traffic capacity and flow (see Section 2.16.2). The project is also included in the San Francisco Bay Area's transportation planning and funding, including the RTP (MTC 2005). The RTP findings included that implementation of all proposed improvements on a regional basis would decrease passenger hours of delay by 10 percent, reduce travel time for work-related auto trips by more than 0.5 minute on average, and reduce travel time for work-related carpool trips by more than 1 minute on average. Due to the reduction in average travel time and improved traffic flow, carbon dioxide emissions should be reduced on average within the overall regional area.

The Department recognizes the concern that carbon dioxide emissions raise for climate change. However, accurate modeling of GHG emissions levels, including carbon dioxide at the project level, at the project level is not currently possible. No federal, state or regional regulatory agency has provided methodology or criteria for GHG emission and climate change impact analysis. Therefore, the Department is unable to provide a scientific or regulatory based conclusion regarding whether the project's contribution to climate change is cumulatively considerable.

The Department continues to be actively involved on the Governor's Climate Action Team as ARB works to implement AB 1493 and AB 32. As part of the *Climate Action Program at Caltrans* (December 2006), the Department is supporting efforts to reduce vehicle miles traveled by planning and implementing smart land use strategies: job/housing proximity, developing transit-oriented communities, and high density housing along transit corridors. The Department is working closely with local jurisdictions on planning activities; however, the Department does not have local land use planning authority. The Department is also supporting efforts to improve the energy efficiency of the transportation sector by increasing vehicle fuel economy in new cars, light and heavy-duty trucks. However it is important to note that the control of the fuel economy standards is held by the United States Environmental Protection Agency and ARB. Lastly, the use of alternative fuels is also being considered; the Department is participating in funding for alternative fuel research at the University of California Davis.

2.21 Cumulative Impacts

Cumulative impacts are those that result from past, present, and reasonably foreseeable future actions, combined with the potential impacts of this project. A cumulative effect assessment looks at the collective impacts posed by individual land use plans and projects. Cumulative impacts can result from individually minor, but collectively substantial impacts taking place over a period of time.

Cumulative impacts to resources in the project area may result from residential, commercial, industrial, and highway development, as well as from agricultural development and the conversion to more intensive types of agricultural cultivation. These land use activities can degrade habitat and species diversity through consequences such as displacement and fragmentation of habitats and populations, alteration of hydrology, contamination, erosion, sedimentation, disruption of migration corridors, changes in water quality, and introduction or promotion of

predators. They can also contribute to potential community impacts identified for the project, such as changes in community character, traffic patterns, housing availability, and employment.

Section 15130 of the CEQA Guidelines describes when a cumulative impact analysis is warranted and what elements are necessary for an adequate discussion of cumulative impacts. The definition of cumulative impacts, under CEQA, can be found in Section 15355 of the CEQA Guidelines. A definition of cumulative impacts, under NEPA, can be found in 40 CFR, Section 1508.7 of the CEQ Regulations.

2.21.1 Projects Evaluated for Contribution to Cumulative Impacts

The following lists recently completed and future planned transportation and non-transportation projects that were considered for their potential to contribute to cumulative impacts. Major non-transportation projects were identified on I-680 or SR-4 in eastern and central Contra Costa County. Other non-transportation projects were considered if they might have overlapping or proximity cumulative impacts.[16]

- I-680 HOV lanes, Walnut Creek to Martinez (completed in 2005)
- Second Benicia Bridge, I-680 at Carquinez Straight (completed/opened in August 2007)
- SR-4 widening projects in eastern Contra Costa County: Railroad Avenue to Loveridge Road (completed in 2001), and Loveridge Road to west of Somersville Road (in final design/construction)
- Buchanan Field Master Plan Update (at Buchanan Field Airport, which adjoins SR-4 within the project limits) and Hangers and Administration Building project at Buchanan Field
- Contra Costa County Public Safety Command Center (proposed at the county's government office complex on Glacier Drive, off Muir Road)
- New discharge for the CCCSD wastewater treatment plant's wet weather bypass system

[16] Sources consulted included the Governor's Office of Planning and Research CEQAnet database (www.ceqanet.ca.gov), CCTA Web site (www.ccta.net/index.html), and Contra Costa County's Special Projects Web site (www.cocoplans.org/).

- Lowe's Shopping Center development (commercial retail business) proposed at Arnold Industrial Way and Laura Alice Way in Concord

- Lower Walnut Creek and Lower Grayson Creek Floodplain Restoration and Desilting Project between SR-4 and Chilpancingo Parkway.

2.21.2 Cumulative Impact Assessment

Resources determined to have a potential for cumulative impacts are addressed in the following sections. The following resources were determined to have no potential for overlapping impacts in time or place: hazardous materials, geology, farmlands, utilities, visual resources, and cultural resources. The resource areas of air quality, noise, and traffic already included cumulative land use growth projections[17] in their analyses (see Sections 2.3, 2.4, and 2.16), and are therefore not repeated in this section.

2.21.2.1 Land Use, Growth, and Community Impacts

A number of transportation projects, including those listed in Section 2.21.1, have been completed or are in progress to add travel capacity and improve operating conditions on SR-4 and I-680 within eastern and central Contra Costa County. The new Benicia-Martinez Bridge and toll plaza, HOV lanes on I-680, and a series of capacity-increasing projects on SR-4 address existing travel demand within and outside the county as well as the projected future growth described in Section 2.1. Some of the strongest housing growth served by I-680 and SR-4 has been in eastern Contra Costa County (Pittsburg and Antioch) and in Solano County east of the Benicia-Martinez Bridge. In general, business parks and other commercial growth continue to develop along the I-680 corridor in and south of Walnut Creek, Pleasant Hill, and unincorporated county land along or connecting to SR-4. The I-680/SR-4 project will incrementally accommodate and support some of this planned growth. Cumulative land use changes along these corridors will include additional planned commercial developments that rely on freeway access, such as the proposed shopping center development on Arnold Industrial Way. Projects at the Buchanan Field Airport, the County Public Safety Command Center, and the CCCSD facility will all take place within land use areas already designated for these uses. Potentially adverse impacts from any cumulative growth projects, such as the shopping center, will be

[17] Future traffic projects were based on ABAG's Projections 2000 land use forecasts, the MTC's 2001 RTP, and the CCTA Countywide Comprehensive Transportation Plan. ABAG and MTC regularly update these land use and transportation plans. The versions cited were the latest updates to the plans available at the time the traffic studies were performed for this project.

addressed by the county and cities as developments are advanced for local review and approval. Effects could include localized traffic increases, changes in the visual setting (to more intensely developed land), and new infrastructure requirements (such as utilities and storm water runoff). These changes are addressed locally through the General Plan amendment and development review process, which will require avoidance and mitigation for each project.

Specific cumulative land use changes involve property acquisition. Approximately 100 homes in Pittsburg and Antioch have or could be affected by the various SR-4 widening projects. Five to seven residences and potentially a warehouse and a self-storage facility (located on leased Caltrans land) will be affected by the I-680/SR-4 interchange project. No other projects that involve relocations were identified on I-680 or elsewhere in the study area. The residential relocations along SR-4 have already been completed or will not otherwise overlap in time or place with the I-680/SR-4 interchange project. The availability of replacement homes is adequate within the county, even when considered on a cumulative basis, and qualified affected residents and business owners will be assisted and compensated.

2.21.2.2 Noise

Traffic is a predominant noise source along I-680 and SR-4, and soundwalls have been installed over time by Caltrans and private developers along some residential areas fronting the freeways. When Caltrans installs soundwalls, future land use projections (e.g., 20-year design period) are used to estimate the traffic conditions for design and placement of the soundwall, thus taking into account cumulative land use and traffic changes.

The other dominant noise source in the project area is the existing Buchanan Field Airport. The proposed update to the airport master plan will expand aviation uses at the airport, but would not result in any increases at noise sensitive land uses above 61 dBA. The maximum noise levels at land uses affected by this project's freeways are already above this level. Airport noise is periodic and different from a continuous noise source such as a freeway, and would have a negligible change (less than 1 or 2 dBA), if any, when considered with the freeway noise. No new adverse cumulative noise impacts are predicted.

The only overlapping transportation project with regard to potential cumulative changes in the noise setting was the I-680 HOV Lane Project, which has been completed and includes noise barriers along I-680 in the Blum Road area and in the

area north of the Contra Costa Canal. The noise study for the I-680/SR-4 interchange improvements measured and evaluated all areas of I-680 within the proposed interchange project limits, even if soundwalls are already in place or were proposed for construction (at the time of the study) for the I-680 HOV Lane Project. New developments adjacent to the project limits that are potentially sensitive to traffic noise are expected to be responsible for noise mitigation, taking into consideration the plans for the I-680/SR-4 interchange phases.

2.21.2.3 Wetlands

Wetlands in the regional vicinity of the project range from filled or altered wetlands within developed areas or human-made drainage facilities (such as the channelized Walnut and Grayson Creeks), to more expansive freshwater and tidal marshlands along the Suisun Bay area to the north of the project. Wetland restoration efforts in the Pacheco Marsh area north of the project vicinity following years of industrial development and oil spill contamination are generally proving successful, and some local organizations are also pursuing restoration of creek habitat within the regional area.

Other nearby past, present, and future projects that may have the potential for cumulative wetland impacts include the following:

- The completed second Benicia-Martinez Bridge (along I-680 at Carquinez Strait): 9.2 ha (22.8 acres)
- The completed I-680 HOV lanes and potential future BNSF railroad crossing reconstruction (along I-680 between Walnut Creek and Martinez): 0.09 ha (0.22 acre)
- The completed SR-4 East Widening Project (from Railroad Avenue to west of Loveridge Road, Pittsburg): No impact to wetlands
- SR-4 East Widening Project (approved and planned for construction, from Loveridge Road to SR-160): 0.2 ha (0.47 acre)
- Buchanan Field Master Plan update (adjacent to SR-4, and near I-680 within the project limits), Contra Costa County Public Safety Command Center, Lowe's shopping center: No impact to wetlands identified
- Lower Walnut Creek and Lower Grayson Creek Floodplain Restoration and Desilting Project: No impact to wetlands listed; any dredging impacts to wetlands would require a permit and offsetting mitigation

Regulatory permits will be required for proposed fill within jurisdictional wetlands and waters. Projects meeting specific conditions can be permitted by the USACE Nationwide Permit (NWP) program authorized under Section 404 of the Clean Water Act (CWA). The project activities and their impacts appear to qualify for authorization under NWP No. 14 for impacts associated with linear transportation crossings and NWP No. 33 for temporary construction, access, and dewatering impacts. The USACE would determine the Section 404 authorization following submittal of a formal application for the project.

Each of these cumulative projects has mitigation measures applied or incorporated into the project design. For example, the Benicia-Martinez Bridge and the I-680 HOV Lane projects have mitigated their wetland impacts and have been issued regulatory approvals. The projects are also all subject to regulatory and permitting requirements imposed by the USACE, USFWS, CDFG, and RWQCB. Therefore, any potential cumulative impacts of these projects are expected to be fully mitigated, and no substantial residual impacts would occur.

2.21.2.4 Wildlife, and Threatened and Endangered Species

The project region has become increasingly urbanized, and potential wildlife habitat within the project area is mostly disturbed due to development on both sides of I-680 and SR-4. Some confined undeveloped land remains. Wildlife corridors are primarily limited to Walnut and Grayson Creeks (both concrete-lined flood control channels) and a remaining wetland area near the BNSF railroad line that is connected to the Pacheco Creek freshwater marsh.

Other past or planned projects in the regional area along SR-4 in eastern Contra Costa County and on I-680 at the Benicia-Carquinez Bridge are relatively distant and do not affect overlapping areas of vegetation or wildlife habitat. Construction of the proposed I-680/SR-4 interchange phases would overlap a portion of the now-completed I-680 HOV Lane Project, which removed vegetation and common grassland habitat in the median and along the sides of the right-of-way as well as at the interchange loop ramps. The I-680 HOV Lane Project has reseeded areas of the interchange. The I-680/SR-4 interchange project phases would affect some of these revegetated grassland areas previously affected by the HOV lane construction, but the overlap would be limited to common grassland habitat that will be restored. No adverse, cumulative loss of habitat or wildlife impacts is predicted.

Steelhead and salmon are the only special-status species with the potential to be affected by the proposed project. Avoidance measures were required of the contractor during the building of the I-680 HOV Lane Project within the I-680/SR-4 interchange area and would also be applied during the proposed project. With the proposed mitigation and avoidance measures, no adverse cumulative impacts to special-status species would occur.

2.21.2.5 Hydrology, Water Quality, and Storm Water Runoff

Water quality runoff from paved or developed areas has become increasingly regulated to meet regional water quality objectives. Other transportation projects in the regional area, including the new Benicia-Martinez Bridge and highway widening on SR-4 and I-680 have or will cumulatively contribute to storm water runoff that ultimately enters major drainages such as Walnut Creek, Grayson Creek, and Carquinez Strait. Private, individual developments or projects will also require water quality permits and review. Each project requires control or treatment measures to be included in the design and construction in order to meet established permit requirements. These measures will minimize individual and cumulative impacts to water quality that might result from construction and long-term operation and maintenance.

Cumulative storm water runoff from all developed areas, including I-680 and SR-4, has resulted in areas of localized flooding, as discussed in Section 2.10.2.3. To avoid increasing floodplain risk, changes will be made at an existing levee that would maintain (not increase) predicted flood level elevation.