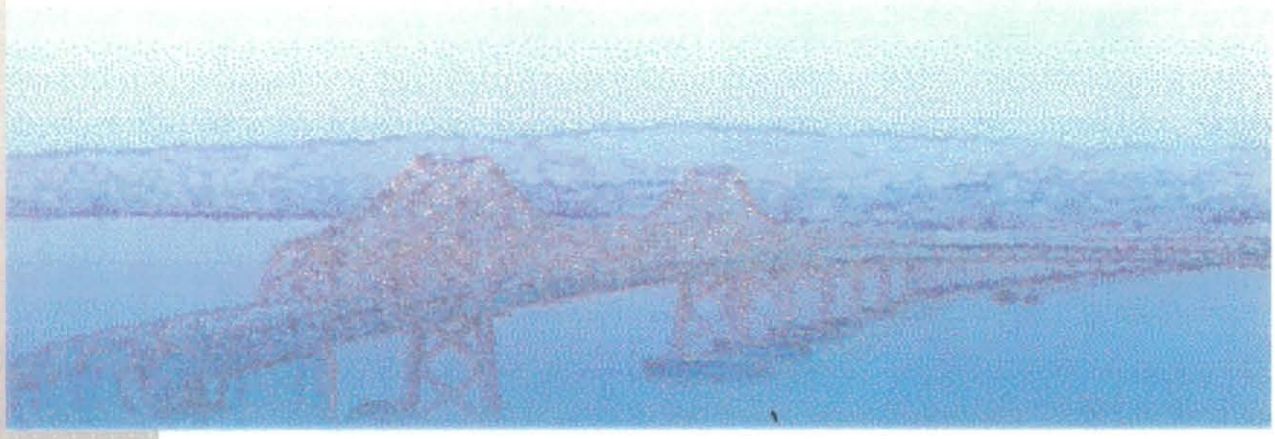
San Francisco – Oakland Bay Bridge
East Span Seismic Safety Project

Final

Environmental Impact Statement/ Statutory Exemption And Final Section 4(f) Evaluation

Volume I - FEIS



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SAN FRANCISCO-OAKLAND BAY BRIDGE EAST SPAN SEISMIC SAFETY PROJECT

on Interstate 80 between
Yerba Buena Island and Oakland
in San Francisco and Alameda Counties

FINAL ENVIRONMENTAL IMPACT STATEMENT/ STATUTORY EXEMPTION AND FINAL SECTION 4(f) EVALUATION

Submitted pursuant to 42 USC 4332 (2)(c), 49 USC 303,
CSHC Section 180.2, and CEQA Section 21080

by the

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

and

THE STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

In Cooperation with the
U. S. COAST GUARD

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ABSTRACT: Caltrans proposes to ensure a lifeline vehicular connection between Yerba Buena Island in San Francisco and the SFOBB Toll Plaza in Oakland by seismically upgrading the existing East Span. Alternatives considered in the Draft EIS included no-build, existing structure retrofit, two replacement alternatives north of the existing bridge, and one replacement alternative to the south. Three bridge main span design variations (cable-stayed, self-anchored suspension, and skyway) were considered. In this Final EIS, Replacement Alternative N-6, the self-anchored suspension design variation with a bicycle/pedestrian path, is identified as the Preferred Alternative and the Least Environmentally Damaging Practicable Alternative (LEDPA). Long-term and temporary impacts include: potential displacement of Caltrans, Navy, and U.S. Coast Guard buildings; changes in visual setting; noise; hazardous wastes; water quality; loss of special aquatic sites and other Waters of the U.S.; disturbance of special status species habitat; and adverse effects to archaeological and historic resources. Mitigation measures include: revegetation; removal of contaminated soils; replacement of special aquatic sites; a treatment plan for archaeological resources; documentation of historic structures; and construction-period traffic control measures and Best Management Practices.

Copies of this Final EIS are available for review at the locations listed in the Preface.

PREFACE

The Final Environmental Impact Statement/Statutory Exemption/Final Section 4(f) Statement (FEIS) for the San Francisco-Oakland Bay Bridge (SFOBB) East Span Seismic Safety Project (East Span Project) summarizes the impacts of alternatives to retrofit or replace the existing East Span. The Federal Highway Administration (FHWA) does not typically include a preface in environmental documents prepared pursuant to the National Environmental Policy Act (NEPA). A preface is provided in this FEIS to summarize events that affected the contents of the FEIS; it also lists the technical studies prepared in conjunction with the FEIS. This preface:

- Summarizes the actions and recommendations concerning design of replacement alternatives of the Metropolitan Transportation Commission (MTC), the regional transportation planning agency for the Bay Area;
- Presents a summary of the results of special studies prepared after publication of the DEIS to address issues raised by interested public agencies; these studies addressed the engineering feasibility used to develop the retrofit and replacement alternatives that are considered in this FEIS;
- Lists the technical studies and analyses that have been prepared for the East Span Project; and
- Identifies the locations where the FEIS and technical studies are available for review.

Project Development Activities Regarding Bridge Design

The MTC has played a major role in developing the East Span Project. MTC is a regional governmental agency that provides regional transportation planning and coordination of transportation activities for the nine-county Bay Area. MTC functions as both the regional transportation planning agency (RTPA), a state designation, and for federal purposes under 23 USC 134, as the region's metropolitan planning organization (MPO). As such, MTC is responsible for implementing the Regional Transportation Plan (RTP), which is a comprehensive blueprint for the development of mass transit, highway, airport, seaport, railroad, and bicycle and pedestrian facilities. Requests from local agencies for state and federal grants for transportation projects are screened by the MTC to determine their compatibility with the RTP. MTC is also the Bay Area Toll Authority (BATA), under Section 30950 of the California Streets and Highways Code.

MTC organized the San Francisco-Oakland Bay Bridge Design Task Force (Task Force) to consider replacement bridge alternatives following Governor Pete Wilson's February 1997 decision that replacement alternatives should be considered. All the members of the Task Force are MTC Commissioners. The Task Force mandate was to develop a consensus recommendation on a design option for a new eastern span of the SFOBB and recommend any additional features that might be included in the design of the bridge that would not be borne by funding allocated from the State of California. Bay Area bridge users, through a toll surcharge at the state-owned toll bridges, will pay for the additional features, such as a bicycle/pedestrian path.

The MTC Task Force formed an Engineering and Design Advisory Panel (EDAP) to advise the Task Force on issues of cost, engineering feasibility, design factors, and seismic safety. The EDAP is comprised of technical experts in structural and civil engineering and architecture. EDAP deliberations included meetings and workshops open to the public for presentation of design concepts from interested parties. Beginning with the first of four formal public hearings on March 27, 1997, the Task Force considered replacement bridge options (e.g., different types of replacement bridge structures) and the cost and feasibility of including amenities such as a tower for the main span and a bicycle/pedestrian path.

The Task Force made its summary recommendations to the California Department of Transportation (Caltrans) on July 30, 1997, concerning replacement bridge types, alignment, and a request for additional analysis needed to determine cost and feasibility of design components and features. Recommendations of the Task Force were transmitted to Caltrans and the State Legislature to assist in the determination of potential funding needs for the project.

In response to Task Force recommendations, Caltrans initiated the requested preliminary design studies. The 30-percent design studies were used to determine the seismic performance, cost, and aesthetics of the bridge types recommended for further study by the Task Force. The EDAP reviewed results of design studies in a series of public meetings and made specific recommendations to the Task Force (see Appendix E: Consultation and Coordination). On June 24, 1998, following extensive public comment, the Task Force forwarded an advisory recommendation to MTC that the replacement bridge be a concrete skyway structure with an asymmetrical self-anchored suspension main span supported by a single steel tower. A 4.7-meter (15.5-foot) wide bicycle/pedestrian path 0.3 meter (1 foot) higher than the traffic lanes located on the south side of the eastbound structure was also recommended and accepted by MTC.

Replacement Alternative N-6, self-anchored suspension design variation with a bicycle/pedestrian path, analyzed in this FEIS, is consistent with the bridge type recommendation defined through the Task Force proceedings and is designated as the Preferred Alternative in this FEIS. Caltrans and the FHWA have considered and performed preliminary engineering on a range of possible project alternatives in accordance with NEPA requirements and in consultation with permitting and regulatory agencies. Five alternatives (No-Build, Retrofit Existing Structure, two replacement bridges north of the existing bridge, and one replacement bridge south of the existing bridge) were considered in the Draft EIS for the East Span Project. Caltrans and the FHWA identified Replacement Alternative N-6 as the Preferred Alternative following circulation of the Draft EIS and consideration of public and agency comments on the document. Copies of the comments are contained in Volume II: Section 1 — DEIS Comments and Responses.

Project Activities Since Release of the DEIS

This FEIS has been prepared pursuant to the requirements of NEPA by FHWA and Caltrans, acting as joint lead agencies. The U.S. Coast Guard is a cooperating agency. The FEIS evaluates potential impacts of the Preferred Alternative

(Replacement Alternative N-6, self-anchored suspension design variation with a bicycle/pedestrian path) as well as four other alternatives that were evaluated in the Draft EIS. The alternatives have been assessed for their ability to provide a seismically upgraded bridge over a portion of San Francisco Bay between Yerba Buena Island (YBI) in San Francisco and Oakland. This project is exempt by statute from the requirements of the California Environmental Quality Act (CEQA) under California Streets and Highways Code (CSHC) Section 180.2 and CEQA Section 21080.

On September 24, 1998, the DEIS was circulated for a 60-day public review period, during which public hearings were held on the project. The hearings were held in Alameda, Contra Costa, San Francisco, and Solano counties in October 1998. Public and agency comments were accepted orally and in writing at public hearings and accepted directly from commenters by mail, facsimile, and e-mail. The public review period closed on November 23, 1998. Some comments, along with new issues raised since the DEIS, led to substantial activity to reexamine several aspects of the project.

The City and County of San Francisco and the Navy expressed strong opposition to any replacement alternative placed north of the existing bridge. The CCSF was concerned with the impacts of a northern alternative on future development of land on YBI that is expected to be transferred from the Navy to CCSF under the Defense Base Closure and Realignment Act. The Navy's opposition to a northern alternative was based on its view that there would be adverse impacts to historic resources and the CCSF's concerns about economic impacts on the future redevelopment potential of properties as envisioned in the Draft Naval Station Treasure Island Reuse Plan (1996 Draft Reuse Plan).

In late 1998 and early 1999, efforts were made to resolve the concerns of the CCSF and the Navy, including meetings and negotiations led by the National Economic Council, an office within the Executive Branch of the federal government. In response to these efforts, Caltrans prepared several additional studies. One study (Land Use Associated with the SFOBB East Span Seismic Safety Project and the Naval Station Treasure Island Draft Reuse Plan, dated January 2000) evaluated the potential impacts of the East Span Project on the CCSF's proposed development on the eastern side of YBI. The conclusion of the study was that CCSF would retain redevelopment potential on the eastern end of YBI with construction of any of the East Span build alternatives, although some adjustments would be required with the northern replacement alternatives. To date, the only public document addressing CCSF's proposals for base reuse is the 1996 Draft Reuse Plan, which was approved by the San Francisco County Board of Supervisors in 1996. As part of its baseline assumptions, the CCSF's Draft Reuse Plan assumed that the existing SFOBB will remain in place, since the plan was prepared before replacement alternatives for the SFOBB had been developed. The Draft Environmental Impact Report (required by the California Environmental Quality Act) and the Draft Environmental Impact Statement (required by the National Environmental Policy Act) for base reuse have not yet been published by the CCSF and the Navy; these pending documents will provide more up-to-date information about the alternatives being considered for base reuse.

Another Caltrans study (CCSF S-1 Modified Alignment and the Impacts to the EMBUD Sewer Outfall, dated November 1999) examined the potential impacts of a southern

alternative that the CCSF was proposing in place of the alternatives discussed in the East Span DEIS. Caltrans concluded that the CCSF Modified S-1 Alternative would result in cost increases in the millions of dollars, increased risk of environmental damage resulting from possible effluent release from the outfall, and complexity of long-term maintenance. Because of the disagreement between the CCSF and Caltrans, the National Economic Council asked the U.S. Army Corps of Engineers (ACOE) to complete an independent review of reports, data, and analyses conducted by both Caltrans and CCSF in regard to impacts to the outfall. On January 7, 2000, the ACOE concluded that constructing the CCSF Modified S-1 Alternative over the EBMUD outfall would delay the project schedule by a minimum of 8 to 15 months, increase construction risks, and increase project costs by tens of millions of dollars.

In February 2000, the CCSF raised two new issues, suggesting that the existing span could be retrofitted to meet lifeline standards and that the design for Replacement Alternative N-6 was unsound. In April 2000, Caltrans completed a report (Replacement vs. Retrofit) to summarize information on these two issues. At the request of the National Economic Council, the ACOE conducted an independent review of the information culminating in conclusions in September and October 2000. The ACOE concluded that replacing the existing bridge would be better than retrofitting it and that the replacement structure type was appropriate. ACOE also stated in its final report that "Based on safety considerations, it is the Corps team's opinion that, at this point in time, a replacement alternative is preferable to a retrofit alternative. A replacement alternative is the path that most quickly resolves the exposure of the public to the seismic vulnerabilities of the existing structure."

Naval Station Treasure Island is currently undergoing base closure and the Navy is working closely with CCSF, the Local Reuse Authority following base closure policies. At the same time the base closure procedure was progressing, Caltrans' project to seismically upgrade the East Span following the 1989 Loma Prieta earthquake was progressing. In order to provide adequate land for the East Span Project, on October 26, 2000, FHWA used its authority under 23 USC 107 (d)[1] to transfer to Caltrans the Navy land on YBI needed for the East Span Project. This action allowed Caltrans to file a deed for the land on October 25, 2000, providing Caltrans with adequate rights-of-way and control of access for construction of any alternative under consideration.

Concerns regarding impacts to historic properties were raised by several parties, including the Oakland Landmarks Preservation Advisory Board and the Navy. Meetings were held in December 1998 and February 1999 to discuss the impacts and possible measures to mitigate project effects on historic properties. The MOA was revised based on consideration of comments received. In late May 2000, an alternative-neutral MOA was executed by all required parties: SHPO, ACHP, USCG, and FHWA (see Appendix O for a copy of the executed MOA). The Navy, local

[1] 23 USC 107(d) states that "Whenever rights of way, including control of access, on the Interstate System are required overlands or interest in lands owned by the United States, the Secretary may make such arrangements with the agency having jurisdiction over such lands as may be necessary to give the State or other person constructing the projects on such lands adequate rights-of-way and control of access thereto from adjoining lands, and any such agency is directed to cooperate with the Secretary in this connection."

governments, and Native Americans were also invited to sign the MOA as concurring parties. Three Native Americans signed the MOA as concurring parties.

In December 1998, following receipt and consideration of all public and agency comments on the DEIS, Caltrans identified a Preferred Alternative (Replacement Alternative N-6). FHWA identified Replacement N-6 as its Preferred Alternative in October 2000, after receiving the results of ACOE's review of retrofit versus replacement. A meeting was held on October 10, 2000 in which FHWA and Caltrans made a presentation to ACOE and the U.S. Environmental Protection Agency (EPA) indicating that Replacement Alternative N-6 was also the Least Environmentally Damaging Practicable Alternative (LEDPA). The USCG also attended the October 10, 2000 meeting. ACOE and EPA asked at the meeting that Caltrans respond to several technical questions regarding environmental impacts and project design. Caltrans subsequently provided the agencies with responses to the questions that had been raised. On February 12, 2001, ACOE concurred with the identification of Replacement Alternative N-6 as LEDPA. EPA concurred on March 15, 2001.

The impacts information presented herein is based upon the following technical studies and analyses that have been prepared for the project.

- Addendum Archaeological Survey Report – Maritime Archaeology
- Addendum Finding of Adverse Effect
- Air Quality Study Memorandum
- Bicycle and Pedestrian Study
- Biological Assessment
- Biological Assessment (Retrofit Existing Bridge Alternative)
- CCSF S-1 Modified Alignment and the Impacts to the EBMUD Sewer Outfall
- Community Impact Assessment
- Conceptual Mitigation Plan for Special Aquatic Sites (presented in Appendix N)
- Consideration of Proposed Mitigation Measures for Project Effects on Historic Buildings and Structures
- Dredged Material Management Plan (presented in Appendix M)
- Finding of Adverse Effect: Buildings and Structures
- Finding of Effect for Archaeological Resources
- Hazardous Wastes Assessment
- Historic Architecture Survey Report
- Historic Property Survey Report
- Land Use Issues Associated with the SFOBB East Span Seismic Safety Project and the Naval Station Treasure Island Draft Reuse Plan
- Location Hydraulic Study
- Natural Environment Study
- Noise and Vibration Study
- Phase I Archaeological Survey Report — Maritime Archaeology
- Positive Archaeological Survey Report
- Relocation Impact Report
- Retrofit vs. Replacement
- Sediment Sampling and Analysis Report
- Supplemental Draft Section 4(f) Evaluation
- Traffic Circulation, Access, and Parking Assessment
- Treatment BMP Feasibility Study
- Visual Impact Assessment

Document Distribution

Copies of this FEIS and the technical studies that support this FEIS are available at the following locations:[2]

Caltrans Public Information Office
111 Grand Avenue
Oakland, CA 94612-3006
(510) 286-4444

Contra Costa County Library
1750 Oakpark Boulevard
Pleasant Hill, CA 94526
(925) 646-6434

Metropolitan Transportation Commission/Association of Bay Area Governments Library
101 Eighth Street
Oakland, CA 94607
(510) 464-7700

Oakland Main Library
125 14th Street
Oakland, CA 94612
(510) 238-3134

San Francisco Main Library
100 Larkin Street
San Francisco, CA 94102
(415) 557-4400

John F. Kennedy Library
505 Santa Clara Street
Vallejo, CA 94590
(707) 553-5568

The FEIS can also be found on the internet at the following website address: www.dot.ca.gov/dist4.

Caltrans can be contacted by e-mail at sfobb.dist04@dot.ca.gov.

This FEIS is being distributed to all persons, organizations, and agencies noted on the distribution list or that have requested a copy. The FEIS will also be made available to interested persons and groups. No action can be taken on the project until a Record of Decision is issued, a minimum of 30 days following the notice of the FEIS availability in the Federal Register.

[2] Because the Positive Archaeological Survey Report, Archaeological Resources and Finding of Effect for Archaeological Resources Report contain confidential information about the location of archaeological resources, they are not available for public review.

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SUMMARY

The California Department of Transportation (Caltrans) proposes to retrofit or replace the San Francisco-Oakland Bay Bridge (SFOBB) East Span, which has carried vehicles between Yerba Buena Island (YBI) and Oakland since 1936. The East Span is a double-deck structure 3,696 meters (12,127 feet) in length carrying five traffic lanes in east-and westbound directions.

This FEIS has been prepared by Caltrans and the Federal Highway Administration (FHWA) pursuant to the National Environmental Policy Act (NEPA) to analyze potential environmental and socioeconomic impacts of several possible replacement bridge alternatives, as well as a retrofit of the existing structure and no-build alternatives. The project is exempt by statute from the provisions of the California Environmental Quality Act (CEQA). The U.S. Coast Guard (USCG) is a cooperating agency as a result of its legal jurisdiction to grant or deny a bridge permit. The U.S. Army Corps of Engineers (ACOE) declined to be a cooperating agency. The U.S. Navy was not a cooperating agency, however it participated in key processes throughout the project.

S.1 PROJECT VICINITY AND PROJECT LIMITS

Alternatives analyzed in this FEIS would seismically retrofit or replace the East Span and involve construction activities and physical changes on both ends of the span at YBI and the Oakland Touchdown and within San Francisco Bay. The western project limit is the eastern portal of the YBI tunnel located within the City and County of San Francisco (CCSF); however, project related traffic controls may extend to the western portal of the YBI tunnel and signage may extend to the West Span approach in San Francisco. The eastern project limit is located approximately 400 meters (1,312 feet) west of the toll plaza on a spit of land referred to as the Oakland Touchdown area in the City of Oakland, Alameda County. Project-related traffic controls and signage could extend east to the toll plaza (See Figure 2-3 in Appendix A). The project study area includes San Francisco Bay waters adjacent to the bridge in which construction activities would occur and Bay waters on the north side of YBI to allow for delivery of bulk materials by barge or vessel to staging areas.

S.2 PURPOSE OF AND NEED FOR THE PROJECT

The SFOBB is an important transportation component of the Bay Area providing regional access between the San Francisco Peninsula and the East Bay. On average 272,000 vehicles currently use the bridge each day. As a component of Interstate 80 (I-80), it is also a critical link in the interstate highway network.

The existing East Span is not expected to withstand a maximum credible earthquake (MCE) on the San Andreas fault (an earthquake of magnitude 8 on the Richter scale) or Hayward fault (an earthquake of magnitude 7 ¼ on the Richter scale); it does not meet lifeline criteria for providing emergency relief access following an MCE; and, it does not meet (all) current operations and safety design standards.

The project's Purpose and Need Statement was drafted following FHWA Technical Advisory T 6640.8 "Guidance Material for the Preparation of Environmental Documents," and more fully developed with public input received at MTC Bay Bridge Design Task Force and Engineering Design Advisory Panel (EDAP) meetings. The Purpose and Need Statement was further refined through a collaborative process among federal agencies as outlined in the NEPA/404 Integration Memorandum of Understanding (MOU) (see Section 1.1 - Project Purpose and Section 1.2 - Need for Project). Due to the scale of the project, some members of the regional community urged that congestion relief be included as part of the project purpose in addition to providing a vehicular lifeline connection. The scope of the project was not expanded to include congestion relief, however, because this would have resulted in lengthy public debate about how best to implement a congestion relief solution including a plan for implementation in the YBI Tunnel and on the West Span. This would have caused the seismic safety component of the project to be substantially delayed. Caltrans anticipates beginning construction of this project in fall 2001; however, this would not have been possible if the scope of the project had included congestion relief.

This project is one of several that Caltrans has completed or is currently undertaking to address the overall need for a bridge connection between the cities of San Francisco and Oakland that meets lifeline criteria. The other projects include replacing the west approach in San Francisco, retrofitting the West Span, West YBI Viaduct and YBI tunnel, and the interim retrofit on the East Span.

S.3 PROJECT DESCRIPTION AND ALTERNATIVES

Twelve alternatives, in addition to the No-Build Alternative, were considered during the scoping phase of this project. Five alternatives including the No-Build Alternative were carried forward for the detailed analysis in this EIS, as described below. The project alternatives are shown on Figure 2-3 in Appendix A.

S.3.1 No-Build Alternative

The No-Build Alternative, which would retain the existing SFOBB East Span, would not meet the project purpose and need criteria and was evaluated primarily as a basis for comparison with the build alternatives. The No-Build Alternative assumes the seismic improvements to the East Span that were completed under the Interim Retrofit Project, completed in the summer of 2000, which strengthened bents and columns on the viaduct section on YBI and strengthened piers, bents, and trusses at selected locations on the cantilever and skyway portions of the structure.

S.3.2 Replacement Alternative N-6 (Preferred)

Replacement Alternative N-6 would meet the project purpose and need criteria. This alternative involves constructing a new bridge (two side-by-side bridge decks, each deck consisting of five lanes) north of the existing alignment and dismantling the existing structure. This alignment has been designed to maximize views of the San Francisco skyline to the north of YBI for westbound motorists and views of the East Bay Hills for eastbound motorists, while minimizing construction in portions of the Bay where geologic conditions could increase the complexity and cost of constructing bridge

piers. The overall length of Replacement Alternative N-6 is approximately 3,514 meters (11,525 feet). Approximately 600 meters (1,968 feet) east of the YBI Tunnel, the alignment would transition from a double-deck viaduct structure to two parallel structures and would conform to existing traffic lanes at the Oakland Touchdown area approximately 1,300 meters (4,264 feet) to the west of the SFOBB Toll Plaza. Replacement Alternative N-6 would include a bicycle/pedestrian path on the south side of the eastbound structure. The path would be 4.7-meter (15.5-foot) wide and 0.3 meter (1 foot) higher than adjacent eastbound traffic lanes.

S.3.3 Replacement Alternative N-2

Replacement Alternative N-2 would meet the project purpose and need criteria. This alternative is similar to Replacement Alternative N-6, but the proposed bridge would be aligned north of the existing structure, and south of Replacement Alternative N-6. The alternative has been designed to minimize the length of the new bridge by closely following the alignment of the existing East Span. Approximately 600 meters (1968 feet) east of the YBI Tunnel the alignment would transition from a double-deck viaduct structure to two parallel structures. The 3,479-meter (11,411-foot) long span would reach the Oakland shore along the northern edge of the existing Oakland Touchdown area and conform to the existing traffic lanes approximately 1,300 meters (4,264 feet) to the west of the SFOBB Toll Plaza. Replacement Alternative N-2 would include a bicycle/pedestrian path on the south side of the eastbound structure. The path would be 4.7-meter (15.5-foot) wide and 0.3 meter (1 foot) higher than adjacent eastbound traffic lanes.

S.3.4 Replacement Alternative S-4

Replacement Alternative S-4 would meet the project purpose and need criteria. This alternative involves constructing a new bridge (two side-by-side bridge decks, each deck consisting of five lanes) south of the existing alignment and dismantling the existing structure. Replacement Alternative S-4 has been developed to avoid conflicts with the in-Bay portion of the existing East Bay Municipal Utility District (EBMUD) sewer outfall, which parallels the existing East Span to the south (see Figure S-1). This alternative would exit the YBI Tunnel on a double-deck viaduct structure and transition to two parallel structures approximately 600 meters (1,968 feet) east of the YBI tunnel. The 3,550-meter (11,644-foot) long span would reach the Oakland shore south of the existing East Span and conform to the existing traffic lanes approximately 1,500 meters (4,920 feet) to the west of the SFOBB Toll Plaza. Replacement Alternative S-4 would include a bicycle/pedestrian path on the south side of the eastbound structure. The path would be 4.7-meter (15.5-foot) wide and 0.3 meter (1 foot) higher than adjacent eastbound traffic lanes.

S.3.5 Retrofit Existing Structure Alternative

The Retrofit Existing Structure Alternative would not fully meet purpose and need criteria. This alternative would seismically retrofit and rehabilitate the existing East Span to withstand an MCE without collapse, but the bridge would most likely experience substantial damage requiring extensive repair or reconstruction that would involve an extended period of closure. This alternative does not meet lifeline criteria

because the closures would impede the bridge's ability to provide emergency relief access. The alignment of the bridge would remain unchanged. Improvements would be made to the existing structure and the East YBI Viaduct that would strengthen the substructure and modify the superstructure to permit large displacements at specified joints. In addition, two new piers would be added to the cantilever main span to provide additional support. In addition, the Retrofit Existing Structure Alternative would not permit changes to the existing bridge (roadway design); therefore, current design standards could not be attained.

S.3.6 Preferred Alternative and Least Environmentally Damaging Practicable Alternative

In December 1998, after a thorough evaluation of project alternatives and consideration of comments from the public and agencies on the DEIS, Caltrans identified Replacement Alternative N-6, self-anchored suspension design variation including a bicycle/pedestrian path, as its Preferred Alternative. In October 2000, FHWA also identified Replacement Alternative N-6 as the Preferred Alternative. Replacement Alternative N-6 has been identified as the Preferred Alternative on the basis of greater ease of construction of the main tower based on geologic conditions, aesthetic benefits such as enhanced drivers' views, and consistency with regionally preferred alignment and design features such as expressed by the Metropolitan Transportation Commission.

On February 12, 2001, ACOE identified Replacement Alternative N-6 as the Least Environmentally Damaging Practicable Alternative (LEDPA) and on March 13, 2001, the Environmental Protection Agency (EPA) also identified Replacement Alternative N-6 as the LEDPA. The basis for the decision was that Replacement Alternative N-6 avoids conflicts with the USCG's YBI facility, does not take land on the Oakland Touchdown designated by the Oakland Base Reuse Authority (OBRA) for a proposed park, provides easier access to bedrock to construct the main span tower, and avoids conflicts with the EBMUD's facilities and operations. (See Section 2.2.6 - Preferred Alternative and Least Environmentally Damaging Practicable Alternative for further detail). The LEDPA determination is required by Section 404 of the Clean Water Act. Letters of concurrence on the LEDPA from ACOE and the EPA can be found in Appendix F.

S.3.7 Design Variations

Design variations identified for the replacement alternatives are limited to the type of bridge to be constructed over the navigational channel. The span type variations include a cable-stayed design, a self-anchored suspension design and a skyway design. In June 1998, after considering seismic performance, aesthetics, costs, and ability to construct the bridge as soon as possible, and the possible location of a bicycle/pedestrian path, the EDAP recommended the self-anchored suspension design.

S.3.8 Costs

Construction costs (2002 dollars), associated with each alternative are shown in Table S-1. The cost for the replacement alternatives shown in the table assume the preferred design variation (self-anchored suspension).

In April 2001, Caltrans published updated cost information for the Preferred Alternative (Replacement Alternative N-6, suspension bridge design option). It reflects cost increases due to such factors as increasing construction costs in a robust and competitive local economy; significant increases in the costs of steel; schedule delays which magnified the inflationary effect; and additional design amenities such as the belvederes and a wider bike path than is standard. Caltrans estimates that the current cost of Replacement Alternative N-6, suspension bridge design option, would be $2.6 billion.

Caltrans did not prepare updated cost estimates for the other project alternatives in April 2001. However, the most significant factors contributing to increased costs would apply to all of the build alternatives.

The enabling legislation for the project, Senate Bill 60, signed by then-Governor Pete Wilson in 1997, anticipated the possible need for additional funding beyond original estimates and required Caltrans to return to the Legislature if necessary. In accordance with Senate Bill 60, Caltrans has submitted its cost estimates to the Legislature and anticipates that it will address the need for additional funding within the next few months.

Table S-1 Cost Estimate Summary for Build Alternatives

Alternative	Cost to Construct (in $ billions)
Replacement Alternative N-6	1.50 – 1.65
Replacement Alternative N-2	1.55-1.60
Replacement Alternative S-4	1.55 – 1.60
Retrofit Existing Structure	0.90

Source: Caltrans, May 1998

S.3.9 Accommodation of Multi-Modal Strategies

While none of the project alternatives presented above would include facilities for high occupancy vehicle (HOV) lanes or rail transit, a retrofitted East Span or a replacement span could accommodate an HOV lane or light rail transit (LRT) by converting one travel lane and one shoulder in each direction, reducing the capacity of the East Span to four travel lanes, and making some structural modifications. Since multi-modal strategies would reduce the number of mixed-flow travel lanes, the selected strategy would have to capture a ridership that matches the loss in mixed-flow vehicular capacity on the SFOBB and its approaches. Otherwise, vehicular operations on the SFOBB and approaches would be comparatively worse. The accommodation of rail and five lanes of traffic would require significant modifications.

As currently proposed, the retrofit or replacement East Span could accommodate the live loads associated with LRT type trains. "Heavier" vehicles, such as commuter or high-speed rail, could also be accommodated but would require that substantial modifications be made to the current designs.

An HOV lane or rail on the East Span would therefore be structurally and operationally feasible; however, it was determined that implementation of either multi-modal strategy would involve substantial institutional and funding challenges.

An HOV lane or rail on the SFOBB has not been identified as necessary in any regional planning process or document. Neither the HOV nor a rail system is currently identified as a regional transportation priority. Before either can be included in the Regional Transportation Plan (RTP) as a priority, new institutional arrangements would be required, such as the identification of a governing body to operate the rail system. The body would not be created until there is a regional consensus on the strategy. This consensus does not currently exist.

The construction and operation of the facilities necessary to implement an HOV or rail system would require additional funding and sources of funding beyond those committed to the East Span Project. A rail system, in particular, would involve areas well beyond the SFOBB itself, because rail would be part of a much larger system extending throughout the region. No funding has been programmed or identified for either HOV lanes or rail on the bridge.

The implementation of any multi-modal strategy on the SFOBB would be subject to independent evaluation and funding as a separate project in the future. The East Span Project does not preclude the implementation of an HOV lane or a rail system on the East Span in the future.

S.3.10 Alternatives Considered but Withdrawn

In addition to the alternatives considered above, Caltrans considered other project alternatives that were ultimately withdrawn from further consideration. These alternatives included the following: four northern alignments and four southern alignments for a replacement bridge with two side-by-side decks and a double-deck structure for either a northern or a southern alignment (see Figure 2-19 in Appendix A for side-by-side replacement alternatives).

These alternatives were rejected for a variety of reasons, as described in Section 2.7-Alternatives Considered and Withdrawn. Important considerations that contributed to rejection or withdrawal of alternatives included adverse geologic conditions (deep young Bay Mud and distance to bedrock for founding the main tower), inability to meet American Association of State Highway and Transportation Officials (AASHTO) design standards, less than optimal roadway geometry, constructablilty issues for temporary detours, conflicts with the EBMUD sewer outfall, and limitations on panoramic views.

S.3.11 Design Variations Considered But Withdrawn

Replacement refinement studies evaluated variations for the bridge profile, which refers to the rise in roadway elevation from the Oakland Touchdown area to the YBI East Viaduct connection. Although the MTC Bay Bridge Design Task Force Engineering and Design Advisory Panel (EDAP) stated a general preference for the elevated grade profile variation, a constant grade profile has been used in this analysis. Substantial cost savings were identified when the profile at the main span tower was lowered to a position similar to the constant grade variation yet was still acceptable to the overall bridge architecture. Additionally, construction of the bicycle/pedestrian path at the same grade as the bridge rather than at an elevated grade would produce slightly slower downhill speeds for bicyclists and result in improved safety for path users.

Single and dual-tower options were considered for the main span towers for the cable-stayed and self-anchored suspension design variations. Following an evaluation of seismic safety, potential environmental impacts, construction requirements, and aesthetic considerations, the single-tower design option was recommended by the EDAP and a dual-tower option was withdrawn from further consideration.

Through several meetings, Caltrans considered the interests and opinions of the Bicycle/Pedestrian Advisory Committee (BPAC). The committee considered design variations for a bicycle/pedestrian path on the replacement alternatives including a single path on one structure and dual paths, one on each structure. Caltrans also analyzed replacement alternatives without a path.

Based on recommendations of the committee and the approval by MTC to use toll revenues to fund a path, a single 4.7-meter (15.5-foot) wide path elevated 0.3 meter (1 foot) above the adjacent eastbound travel lanes has been added to the design of the eastbound structure for the replacement alternatives. BPAC's initial recommendation of a dual path design was not selected for the following reasons:

- Environmentally sensitive areas on the north side of the westbound structures at the Oakland Touchdown pose access constraints that do not exist with the single-path design;
- For security purposes (on days when the number of path users is moderate) it would be better to have all users on one path than spreading them over two paths;
- The cost of two paths would be greater; and
- The path on the north side of the westbound span heading uphill from Oakland to YBI could interfere with motorists' views.

S.4 ENVIRONMENTAL AND SOCIOECONOMIC IMPACTS AND PROPOSED MITIGATION MEASURES

The No-Build Alternative would not implement any improvements and would therefore have no socio-economic or environmental impacts. However, such impacts could occur in the event of an MCE because the existing bridge would continue to be vulnerable to damage or collapse.

The Retrofit Existing Structure Alternative and all of the replacement alternatives, including the Preferred Alternative, would have short-term construction related and long-term (permanent) impacts on the physical and socioeconomic environment of the project study area.

Summary of Impacts

Table S-3 at the end of this chapter provides a summary of the environmental impacts of the project alternatives and proposed mitigation measures.

S.5 CONSULTATION AND COORDINATION

FHWA and Caltrans served as the joint lead agencies in preparation of this Environmental Impact Statement (NEPA)/Statutory Exemption (CEQA). The U.S. Coast Guard is a cooperating agency.

This environmental document was prepared in consultation and coordination with various federal, state, and local agencies and organizations. Notable consultation and coordination activities are summarized below.

S.5.1 Project Organization and Committees

Several groups were organized to advise Caltrans and FHWA decision-makers for the East Span Project. Table S-2 lists the groups and their roles.

Table S-2 Project Advisory Groups

Group	Role
Project Development Team (PDT) (Comprised of 31 Federal, State, and local agencies, elected officials, special service districts and professional organizations.)	Served as the technical advisory committee to Caltrans. Met periodically to address project issues requiring technical direction or resolution.
Metropolitan Transportation Commission Bay Bridge Design Task Force (Comprised of seven Metropolitan Transportation Commission Commissioners.)	Coordinated local deliberations on the location, design and potential funding strategies for a replacement structure.
MTC Bay Bridge Design Task Force Engineering and Design Advisory Panel (EDAP) (Comprised of technical experts in structural and civil engineering, seismicity and geology, and (bridge) architecture.)	Provided technical expertise, analysis and recommendations to the Task Force.
Bicycle/Pedestrian Advisory Committee (BPAC)	Represented the interests of various groups advocating installation of a

(Comprised of key members from ad-hoc bicycle, alternative transit, elderly/disabled community, and public access groups.)	bicycle/pedestrian path and proposed design features of the path on replacement alternatives.
Oakland Gateway Planning Group (Comprised of the East Bay Regional Park District, San Francisco Bay Conservation and Development Commission, Port of Oakland, City of Oakland, Oakland Landmarks Preservation Advisory Board, Oakland Army Base Reuse Authority, National Park Service and the Association of Bay Area Governments/Bay Trail, and Caltrans.)	Coordinated efforts to begin planning a shoreline park in the Oakland Touchdown area.

S.5.2 Key Interagency Coordination

NEPA/404 Integration Memorandum of Understanding (MOU) Process

Since September 1997, consultation has been ongoing with federal agencies under the western states Memorandum of Understanding (MOU) for integrating the requirements of NEPA and Section 404 of the Federal Clean Water Act. Under the MOU process, the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), the ACOE, the EPA and the Federal Transit Administration (FTA) have been asked to concur on the project purpose and need statement, criteria for alternative selection, and range of alternatives to be considered. Several meetings have been conducted to date under the MOU process. At the meetings, participants from the agencies listed above considered the seismic safety-based project purpose and need statement and the range of alternatives proposed for evaluation. Following the meetings, written concurrence was received from each signatory agency (letters are presented in Appendix F).

Consistent with the NEPA/404 Integration MOU, Caltrans and FHWA have identified Replacement Alternative N-6 as the Preferred Alternative in December 1998 and October 2000, respectively. The ACOE and the EPA identified Replacement Alternative N-6 as the LEDPA in February and March 2001, respectively, pursuant to Section 404(b)(1) of the federal Clean Water Act. EPA, ACOE and USFWS have also provided their preliminary agreement on conceptual mitigation for impacts to special aquatic sites (see letters in Appendix F).

Other federal, state, and regional agencies with regulatory and permitting obligations for the East Span Project were invited to participate in the NEPA/404 MOU meetings. These included:

- U.S. Coast Guard (Cooperating Agency);
- San Francisco Regional Water Quality Control Board;
- San Francisco Bay Conservation and Development Commission;

- California Department of Fish and Game; and
- Metropolitan Transportation Commission.

Coordination Regarding Historic Properties Pursuant to Section 106 of the National Historic Preservation Act

Meetings regarding historic resources involving Caltrans, the FHWA, the State Historic Preservation Officer (SHPO), the Navy, the USCG, the cities of Oakland and San Francisco, and the Advisory Council on Historic Preservation (ACHP) were held in compliance with Section 106 of the National Historic Preservation Act and its implementing regulations.

In April 1997, several organizations were invited to submit comments on the East Span Project with respect to historic properties. These organizations included:

- American Society of Civil Engineers, History and Heritage Committee;
- Berkeley Architectural Heritage Association;
- California Preservation Foundation;
- Foundation for San Francisco's Architectural Heritage;
- National Trust for Historic Preservation, Western Regional Office;
- Oakland Heritage Alliance;
- Oakland Landmarks Preservation Advisory Board; and
- San Francisco Landmarks Preservation Advisory Board.

In July 1997, Caltrans gave a brief presentation on the East Span Project to representatives of the Oakland Landmarks Preservation Advisory Board, Oakland Heritage Alliance, California Preservation Foundation, and San Francisco Landmarks Preservation Advisory Board. The Oakland Landmarks Preservation Advisory Board (LPAB) responded by letter on January 14, 1998, advocating that consideration be given to a retrofit of the existing bridge rather than a replacement and suggesting several mitigation measures if a replacement alternative were selected (See Appendix G for a copy of the letter).

Since then, Caltrans and the Oakland Landmarks Preservation Advisory Board (LPAB) have continued to coordinate regarding potential mitigation measures and other historic preservation issues associated with the East Span Project.

On December 10, 1998, Caltrans held a meeting with representatives from the City of Oakland and its Landmarks Preservation Advisory Board, the Oakland Heritage Alliance, and the Port of Oakland to discuss possible measures to mitigate project effects on historic properties.

On February 1, 1999, representatives from the Advisory Council on Historic Preservation ACHP, Caltrans, FHWA, the Navy, the CCSF, the USCG, and the SHPO toured the project area and the historic properties.

The following day, meetings were held to discuss project effects on historic properties and mitigation. Representatives from the CCSF, California Preservation Foundation, National Park Service (NPS), Navy, USCG, FHWA, SHPO, and ACHP attended the first

meeting and discussed the differing effects of the replacement alternatives on the Navy's historic properties on Yerba Buena Island and measures proposed to mitigate project effects on them. Representatives from the City of Oakland's Landmarks Board and Public Works Department, Port of Oakland, FHWA, SHPO, and ACHP attended the second meeting and discussed measures to mitigate for the loss of the East Span under the replacement alternatives.

An Addendum Finding of Adverse Effect Report and Consideration of Proposed Mitigation Measures were sent to the SHPO, ACHP, Navy, USCG, local governments, and other interested parties in October 1999. A draft Memorandum of Agreement (MOA), included in the Consideration of Proposed Mitigation Measures Report, was also distributed for review and comment. After consideration of comments, the MOA was finalized and executed in May 2000. On May 26, 2000, an alternative-neutral MOA was signed by all required parties: SHPO, ACHP, USCG, and FHWA. The Navy, local governments, and Native Americans were also invited to sign the MOA as concurring parties and the MOA was circulated to these concurring parties in June 2000. Three Native Americans signed the MOA as concurring parties. A copy of the MOA is included in Appendix O.

Coordination has taken place with Native Americans concerning archaeological site SFr04/H. In November 1997, Caltrans solicited comments from 14 Native Americans regarding the upcoming excavation. The names of the Native Americans were provided by the California Native American Heritage Commission. Two Native Americans responded. The Archaeological Survey Report for SFr04/H, based on the excavation was sent to the Native American Heritage Commission and the Native American monitor who was present during site excavations. Caltrans will provide the treatment plan currently being prepared for the site to all Native Americans on the NAHC list and all signatories to the MOA with the goal of soliciting early input on its development.

For additional information, please see Sections 3.10 and 4.10 - Historic and Cultural Resources, Appendix E - Consultation and Coordination for chronology of Section 106 consultation, and Appendix O - Memorandum of Agreement.

Coordination Pursuant to Section 4(f) of the Department of Transportation Act

Section 4(f) of the Department of Transportation Act of 1966, codified in Federal law at 49 U.S.C § 303, declares that "[i]t is the policy of the United States Government that special effort be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites."

Coordination pursuant to 4(f) took place concerning historic resources and the Gateway Park as summarized below.

What about Hunter's Point Nimitz historic structures for this? See next page

Historic Resources

Pursuant to Section 4(f), coordination took place concerning historic resources such as the existing East Span and the historic structures on YBI. Details of this coordination can be found in the section above titled, Coordination Regarding Historic Properties Pursuant to Section 106 of the National Historic Preservation Act.

Gateway Park

The proposed Gateway Park is located at the Oakland Touchdown (see Figure 6-9 in Appendix A) on land that is part of the former Oakland Army Base (OARB). The OBRA's Reuse Plan designates 5.9 hectares (14.7 acres) at the westernmost portion of the Army Base as the site of a proposed public access shoreline park.

Caltrans initiated coordination meetings with the East Bay Regional Park District (EBRPD) and the Port of Oakland to discuss the East Span Project, land use issues, and Gateway Park development possibilities. The City of Oakland, the Army, the NPS, San Francisco Bay Conservation and Development Commission (BCDC), and Association of Bay Area Governments (ABAG) have also participated. Meetings to discuss the proposed park were held on October 7, 1997; November 18,1997; February 18, 1998; July 22, 1998; December 2, 1998; February 10, 1999 and August 11, 1999.

In response to the Department of the Interior's letter commenting on the DEIS, Caltrans and FHWA held a meeting with interested agencies on March 11, 1999 to discuss the status of the Gateway Park in relation to Section 4(f). In addition to Caltrans and FHWA, participants included staff from the City of Oakland, EBRPD, Port of Oakland and the National Park Service.

Participation by the National Park Service

The NPS participated in activities associated with the proposed Gateway Park in coordination with the East Span Project. The NPS attended meetings on October 7, 1997; November 4, 1997, February 18, 1997; May 20, 1997; June 2, 1998; July 22, 1998; and March 11, 1998. The NPS's key concern was the impact that Replacement Alternative S-4 could have on the Gateway Park.

City of Oakland

Numerous meetings were held with the Mayor's Office and staff from Planning, Economic Development, Landmarks Preservation Advisory Board, and Public Works divisions. City representatives have made presentations and comments at other public meetings, such as the MTC Bay Bridge Design Task Force and EDAP. The City's key concerns are the aesthetic design of the East Span and the Oakland Touchdown area, mitigation for impacts to the historic qualities of the existing East Span and the potential for community involvement and employment during the construction phase.

City and County of San Francisco

Numerous meetings were held with the Mayor's Office (Treasure Island Project) and staff from the Planning, Traffic and Parking, and Public Works departments. The key concerns of the CCSF are construction period impacts on Yerba Buena Island, land use conflicts that include potential loss of revenue, access impacts at Yerba Buena Island and Treasure Island, and detours and ramps on Yerba Buena Island.

United States Navy

Meetings were held with locally assigned Navy personnel from San Bruno and San Diego and personnel in Washington, D.C. to address the agency's key concerns including impacts to historic resources on YBI, impacts on the Navy's process to dispose of its property on YBI, and construction-period impacts.

United States Coast Guard

Meetings were held with the USCG regarding potential project impacts on its facility on Yerba Buena Island. The Coast Guard's key concerns are 24-hour, 7 days a week access to its facility during and after construction, slope stability, land use conflicts (including the replacement of four USCG buildings), and impacts to crew quality of life from construction-period activities such as noise, dust, debris, and safety.

S.5.3 Community Involvement

In addition to the scoping process, public open houses, and public hearings, a variety of public participation activities have been conducted over the course of the engineering and environmental studies. These public involvement activities are listed below followed by a brief description (please see Appendix E for additional information).

Scoping Meetings

MTC Bay Bridge Design Task Force scoping meetings gave agencies and the general public the opportunity to provide input on alternatives and issues to be evaluated in the EIS. Meetings were held in Contra Costa, Alameda, Solano, and San Francisco counties on April 16th, 22nd, 23rd, and May 8th, 1997, respectively.

Open Houses

Four additional public information open houses were provided to enable interested Bay Area residents to view the preliminary design concepts and obtain more information about the project. The open houses were held in Alameda, Contra Costa, San Francisco, and Solano counties on December 8th, 9th, and 11th, 1997 and March 25, 1998, respectively. Approximately 300 people attended.

Environmental Organizations Meeting

On October 3rd, 1997, Caltrans held a meeting with environmental interest groups in collaboration with BCDC and MTC. The goal of the meeting was to solicit the environmental concerns of these groups and provide them with information on the project purpose and need, alternatives, the environmental process, and construction schedules. In addition, information was mailed out to several of the groups that did not attend.

Public Hearings and Response to Comments on the DEIS

Following distribution of the DEIS, Caltrans and FHWA held four public hearings to give the public an opportunity to learn more about the project and to discuss the project with Caltrans staff. A copy of the DEIS was available for viewing at each meeting and also available on the Caltrans website. These hearings were held in Alameda, San Francisco, Contra Costa, and Solano counties on October 14, 15, 20 and 22, 1998, respectively. Approximately 174 people signed in as attending the hearings. Many other people who dropped in to view the exhibits or talk with staff did not sign the attendance sheets. Public and agency comments on the DEIS were accepted orally and in writing at the above-mentioned public hearings and accepted from other people by mail, facsimile, and e-mail. Approximately 700 individual comments on the DEIS were received, and responses are included in Volume 2 of the FEIS.

Other Public Outreach

Additional public involvement has included a total of 65 presentations given to various public groups, agencies, and professional associations over the course of the project. Four issues of a project newsletter were also distributed to over 3,500 interested parties including federal, state, and local agencies; elected and appointed officials; city and county staff; special interest groups; and the general public. The newsletters described the study alternatives, process and schedule, announced the community workshop series, and provided information about study progress and activities. Newsletters will continue to be produced and distributed periodically.

S.6 APPROVALS REQUIRED

The project requires the following approvals from federal, state, and regional agencies (see Appendix E for additional information):

- National Marine Fisheries Service - Incidental Harassment Authorization pursuant to the Marine Mammal Protection Act, Section 7 of the Endangered Species Act consultation, and essential fish habitat consultation;

- U.S. Army Corps of Engineers - Concurrence on the LEDPA and preliminary agreement on the conceptual mitigation plan for special aquatic sites. Combined Section 404 of the Clean Water Act Individual Permit and Section 10 of the Rivers and Harbors Act Permit; if appropriate, permit disposal of dredged materials at the Deep Ocean Disposal Site;

- U.S. Coast Guard - Approval of the location and placement of bridges under the General Bridge Act of 1946 and Section 9 of the Rivers and Harbors Act;
- U.S. Environmental Protection Agency - Concurrence on LEDPA and preliminary agreement on the conceptual mitigation plan for special aquatic sites;
- U.S. Fish and Wildlife Service- Section 7 of the Endangered Species Act consultation and preliminary agreement on the conceptual mitigation plan for special aquatic sites;
- San Francisco Bay Conservation and Development Commission (BCDC) - Major Permit pursuant to the McAteer-Petris Act and Federal Consistency Determination pursuant to the Coastal Zone Management Act;
- California Department of Fish and Game - Section 2090, Fish and Game Code requires participation in USFWS Section 7 of the Endangered Species Act consultation process;
- Regional Water Quality Control Board - Grant a certificate or waiver for compliance with Section 401 of the Clean Water Act;
- Compliance with Section 106 of the National Historic Preservation Act of 1966; and
- State Lands Commission - Permit for disposal of dredged materials if materials are disposed of on State lands.

S.7 CONTROVERSIAL ISSUES

Issues of controversy associated with the East Span Project include:

- Accommodation of rail service on the bridge;
- Disposal of dredged materials;
- Construction-period impacts on YBI;
- Future land use scenarios on YBI;
- Access ramps to and from YBI;
- The gateway to Oakland;
- The design of the bicycle/pedestrian path (replacement alternatives);
- Bridge alignment (build alternatives);
- The MOA;
- Safety of bridge design (replacement alternatives); and
- Bridge design parameters.

While these issues are not fully resolved, none of them would prevent the project from being implemented as the issues move toward resolution. The following is a summary of each issue and how they either have been or will be resolved.

Rail Service

The provision of rail service on the replacement alternatives is an issue raised by some East Bay communities and the City and County of San Francisco. Section 2.5 – Accommodation of Multi-Modal Strategies, identifies the fundamental obstacles to implementing rail service on the SFOBB as part of this project. However, it is likely that additional public discussion of rail service on the SFOBB and in the larger Transbay Corridor will continue since Phase 1 of the MTC Bay Bridge Rail Alternatives Study, completed in June 2000, concluded that replacement alternatives could accommodate light rail in the future.

Dredged Materials Disposal

Disposal of dredged material in the San Francisco Bay is a highly regulated activity. Many reviewers of the DEIS commented that it did not adequately address plans for disposal, quality of dredged material and how the project complied with the disposal regulation process.

Since publication of the DEIS, a Dredged Material Management Plan (DMMP) was prepared for the project and is included as Appendix M. The DMMP was developed in accordance with the Long Term Management Strategy (LTMS) that provides a policy framework and strategies for the placement of dredged material in the Bay region. The DMMP assesses impacts from dredging and disposal activities associated with construction and evaluates a range of reuse/disposal options for the dredged material. Some disposal options considered in the DMMP are not currently available, but may become available during project construction. Sediment sampling and analysis have also been completed to determine how much dredged material is suitable for unconfined aquatic disposal; a letter from the Dredged Material Management Office on October 31, 2000 outlines its conclusions regarding suitability (see Appendix G - Agency Consultation Letters). Final disposal options will be determined based on permitting processes, site availability and cost-effectiveness.

Construction-Period Impacts

Several agencies are concerned about the adequacy of Caltrans' efforts to reduce and/or mitigate construction period impacts.

Construction-period impacts are identified in Section 4.14 - Temporary Impacts During Construction Activities. Caltrans is coordinating with USCG, the CCSF, EBMUD and other agencies about their specific construction-period concerns, some of which are discussed in Section S.5.2 - Key Interagency Coordination. Caltrans will continue coordination with these agencies during project construction to reduce construction-period impacts to their facilities and operations.

YBI Land Use

The Naval Station Treasure Island is closed and the Navy is in the process of transferring its property to the CCSF. The Navy and the CCSF are concerned about

how the replacement alternatives will impact the land transfer and reuse plans outlined in the 1996 Draft Treasure Island Reuse Plan.

Based on preliminary information included in the CCSF's Draft Treasure Island Re-use Plan, potential land use impacts on YBI resulting from replacement alternatives are identified in Section 4.1.6 - Development Trends. The redevelopment concepts described in the 1996 Draft Reuse Plan can be generally accommodated with any of the East Span Project alternatives. The general reuse of Quarters 1 through 7, redevelopment of Building 262, development of a conference center, live/work units and artisan cottages can co-exist with Replacement Alternatives N-6, N-2, and S-4 or the Retrofit Existing Structure Alternative. Caltrans will coordinate with the CCSF to develop compensatory measures for documented losses in rental income from Quarters 1-7 incurred during the construction period and to establish protective measures to prevent construction-period damage to Quarters 1-7 and Building 262.

YBI Access Ramps

The CCSF requested that Caltrans provide new access ramps to YBI.

As part of the East Span Project, the eastbound on-ramp on the east side of the YBI tunnel would be rebuilt to current standards; Caltrans developed preliminary configurations for the other ramps for the CCSF to consider; however, the reconstruction and funding for other new ramps on YBI, which are owned by the Navy, are not part of the East Span Project. Future improvements to the other ramps are possible under a separate project because MTC has made them eligible for future funding in the Regional Transportation Plan.

Gateway to the City of Oakland

The City of Oakland's key concerns are the contribution of the aesthetic design of the East Span and the Oakland Touchdown area to a gateway entrance to the City and mitigation for impacts to the historic qualities of the existing East Span.

Caltrans has met with the City to discuss its concerns about the development of a gateway entrance at the Oakland Touchdown. A gateway entrance to the Oakland Touchdown area is beyond the scope of the East Span Project. Caltrans will cooperate with the East Bay Regional Park District in its planning program for the Gateway Park. It is assumed that EBRPD will include the City of Oakland as part of the park planning process. Please see Memorandum of Agreement discussion below for mitigation measures for impacts to the historic qualities of the existing bridge.

Design of Bicycle/Pedestrian path (replacement alternatives)

The replacement alternatives include the single bicycle/pedestrian path recommendation made by the Bicycle/Pedestrian Advisory Committee (BPAC) to the MTC Task Force, though the dual path was BPAC's first choice. BPAC's initial recommendation was a path on each structure at about the level of the roadway. This was not selected by MTC for reasons discussed in Section S.3.10 - Design Variations Considered But Withdrawn. Some members of the bicycling community expressed strong support for other path locations such as below-deck designs. Although complete consensus may not have been reached within the bicycling community, BPAC's recommendations have not changed and for purposes of identifying the preferred alternative, the adoption of one of BPAC's recommendations has resolved the issue.

Bridge Alignment (build alternatives)

Public agencies have expressed their opinions and preferences for certain build alternatives based on their views of potential impacts of construction period activities and/or the permanent structure. Agencies that have expressed a preference for a particular alignment include but are not limited to the CCSF, USCG, Navy, the City of Oakland, the Port of Oakland, BCDC, EBRPD, and EBMUD.

Caltrans has held several meetings with these agencies to date to discuss their preferences for a particular bridge alignment and what the impacts and mitigation would be under the Preferred Alternative.

Memorandum of Agreement

The Navy, the CCSF and the City of Oakland raised concerns about the contents of the MOA, which is intended to mitigate project-related impacts on historic structures. The Navy declined to sign, citing its opposition to northern replacement alternatives and disagreement with the determination of impacts on historic properties; it also requested that the CCSF be included as a concurring party. The CCSF declined to participate in the MOA process because it wanted further consideration of its proposed southern replacement alternative. The City of Oakland declined to sign, raising concerns that the mitigation established for the loss of the historic bridge was not adequate, and that Caltrans and FHWA should consider a variety of other kinds of mitigation suggested by the City.

FHWA and Caltrans considered the concerns raised by the Navy, the CCSF, the City of Oakland, and others regarding the MOA. In an effort to address these concerns, FHWA and Caltrans revised the MOA several times in consultation with the SHPO and ACHP. The SHPO and ACHP's signatures executing the MOA (see Appendix O of this FEIS) indicate agreement with the mitigation measures and the project's compliance with the provisions of Section 106.

Safety of Bridge Design (replacement alternatives)

The CCSF has raised concerns about the safety of the replacement bridge design. A study conducted by the ACOE determined that "the Caltrans design team is highly qualified, using state-of-the-art design methods and is moving along a path to design a bridge that meets the seismic performance criteria." (Final Report, Evaluation & Assessment of Proposed Alternatives to Retrofit/Replace the East Span of the San Francisco-Oakland Bay Bridge, U.S. Army Corps of Engineers, October 27, 2000.)

Bridge Design Parameters

For the East Span Project, Caltrans estimated the greatest rock motions from the Safety Evaluation Event (SEE). This is defined as an earthquake that generates the largest motions expected to occur at the bridge site once every 1,500 years (a 1,500 year return period or a 10 percent probability of occurring during the structure's 150 year expected life). The Seismic Safety Peer Review Panel and the EDAP both accepted and agreed that the bridge should be designed for these SEE ground motions.

A report prepared by the ACOE later concluded that in using these standards, the performance of the bridge could not be predicted in the event of a Maximum Credible Earthquake (MCE), which it defined as the largest earthquake reasonably capable of occurring based on current geological knowledge. The ACOE report erroneously stated that an MCE would be a greater seismic event than a SEE.

During a meeting held on December 7th, 2000 to discuss seismic safety evaluations for the East Span, the Ad Hoc Committee on Ground Motions made a presentation to EDAP about the difference between MCE and SEE. The Ad Hoc Committee determined that ACOE's conclusion regarding SEE and MCE was based on an error in one of the ACOE's tables and that MCE motions fall well below the SEE motions in all relevant data ranges, particularly during the initial shaking. As a result, the Ad Hoc Committee determined that Caltrans is designing a replacement bridge to the higher SEE standard.

of EDAP ~~Board~~

Who do this?

Bruce Bolt was the Ad Hoc chair

S.8 MAJOR UNRESOLVED ISSUES WITH OTHER AGENCIES

Partial Restoration of Barge Access Channel (northern alternatives)

As part of its eelgrass mitigation, Caltrans proposes to fill in a portion of the barge access channel following all construction activities. Raising the level of the Bay bottom to pre-construction elevations would allow for on-site restoration of impacted eelgrass and increase the likelihood of successful eelgrass recolonization. The ACOE and the Regional Water Quality Control Board could permit this mitigation measure. Under its current policies, BCDC would not. However, BCDC is in the process of re-evaluating and revising its marshes and mudflats policies and the revised policies may allow the use of dredge material for restoration/creation of eelgrass beds within its jurisdiction. If the Commission does not change its policies prior to permitting the Bay Bridge, Caltrans would revise its mitigation proposal to eliminate the use of dredged material and allow the channel to fill in naturally.

Bicycle Access to YBI from Path (replacement alternatives)

The CCSF has expressed concerns about bicycle and pedestrian access onto Yerba Buena Island from the western terminus of the bicycle/pedestrian path on the East Span. While the CCSF's Draft Reuse Plan for YBI proposes bicycle and pedestrian modes as the primary modes of transportation on YBI and Treasure Island, bicycle and pedestrian facilities on YBI are currently very limited. Caltrans would consult with the Navy and/or other property owners on YBI about their interest in having directional signage installed for path users on the bridge. If consultation results in agreement on the nature and placement of the signs, Caltrans would install the signage within its right-of way.

Public Access at the Mitigation Site for Special Aquatic Sites

In consultation with the resource agencies, Caltrans proposes to provide on and off-site mitigation for impacts to special aquatic sites. For the off-site mitigation, BCDC staff has requested that Caltrans provide public access by completing a portion of the Bay Trail. BCDC's policies require that a project provide the maximum feasible public access to the Bay consistent with the project. For any of the replacement alternatives, for which the off-site mitigation is a component, Caltrans would provide a bicycle and pedestrian path with belvederes from the Oakland Touchdown to Yerba Buena Island, and a public access staging area with parking at the Oakland Touchdown. These public access facilities are a significant investment and are unprecedented in the Bay Area in terms of cost. Caltrans does not propose any public access at, through or around its mitigation area; Caltrans has concluded that public access at the mitigation site is inconsistent with providing high quality habitat for resident and migratory wildlife. Providing public access at the mitigation area, as requested by BCDC staff, may also require the placement of fill in jurisdictional wetlands. Caltrans will continue to work with BCDC through the permitting process to address this public access issue.

S.9 FINAL STEPS

- FHWA will issue a Record of Decision (ROD) to identify its selected alternative and present the basis for its decision in selecting that alternative;
- Notification and issuance of the Section 404 Individual Permit/Section 10 Permit by the ACOE; ACOE issues permit for disposal of dredged material at Deep Ocean Disposal site, if needed;
- Notification and issuance of Bridge Permit by the USCG;
- Notification and issuance of Incidental Harassment Authorization by NMFS;
- Issuance of Water Quality Certification or waiver by Regional Water Quality Control Board;
- Issuance of Major Permit and Federal Consistency determination by BCDC; and
- Continue to seek resolution of unresolved issues with concerned parties.

Table S-3 Summary of Impacts and Mitigations-Build Alternatives

Community				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Employment	The estimated total number of human employment years is projected to be 4,290.	The estimated total number of human employment years is projected to be 4,232.	Same as N-2	The estimated total number of human employment years is projected to be 2,356.
Community Services	No impact	No impact	Due to insufficient clearance between the bridge structure and EBMUD's existing service road, EBMUD's service trucks would be prevented from accessing its dechlorination facility at the west end of the Oakland Touchdown requiring relocation of the service road and/or the dechlorination facility. The road could be relocated to the north, south, via a tunnel or on an overpass. The dechlorination facility could be moved to the east. Potential impacts of relocation are reduced visual public access to the Bay for westbound motorists approaching the bridge if an overpass is constructed, fill in the Bay (approximately 13,650 cubic meters (18,000 cubic yards) and 0.36 hectare (0.9 acre), drainage problems, and/or modifications to the design and/or operation of EBMUD's discharge system. All relocation options entail increased construction and maintenance costs. **Mitigation-** Caltrans would work with EBMUD to relocate the service road and/or the dechlorination facility to maintain EBMUD's operations. Caltrans would obtain necessary permits/permit amendments, fund relocation costs, and implement any necessary mitigation. Caltrans would assure continual operation of EBMUD's discharge system during relocation.	No impact

Existing Land Use				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Former Navy Building 213 on YBI	Would displace Building 213 (which currently serves as storage for one fire truck) on YBI. **Mitigation**-If requested by the Navy, Caltrans will replace Building 213 with a structure of like size, construction materials and quality, built to current building codes. The Navy would need to provide a suitable site for the replacement of Building 213 outside State right-of-way.	Same as N-6	No impact	No impact on Navy buildings.
USCG Buildings on YBI	Would displace buildings 30 (storage), 40 (administration), 75 (vacant), and 270 (vacant). **Mitigation**-Caltrans would provide replacement buildings of like size, construction materials and quality, built to current building codes. The USCG would need to provide suitable sites for the replacements outside State right-of-way.	Same as N-6	Same as N-6	No impacts to USCG buildings.
Land Use on USCG YBI facility	No permanent impact on USCG usable land area.	Same as N-6	Footing and support columns of new bridge would span approximately 1.5 hectares (3.8 acres) of 2 hectares (5 acres) of USCG usable land area. USCG land under bridge could be developed subject to review and approval by Caltrans.	Same as N-6
Land Use at the Oakland Touchdown Area	Would require permanent displacement of 0.2-hectare (0.5-acre) of the City of Oakland-designated Resource Conservation Area north of the existing bridge. New upland/aquatic interface areas would be improved on-site for wildlife.	Same as N-6	See Community Services impacts of Replacement Alternative S-4.	No impact

Section 4(f) Evaluation

Section 4(f) of the Department of Transportation Act of 1966 specifies that "[t] he 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 a 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 1) there is no prudent and feasible alternative to using that land; and 2) 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." Permanent 4(f) uses are summarized below; temporary 4(f) uses are discussed on page S-38.

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Use of Resources Protected by Section 4(f) of the Department of Transportation Act	Removal of existing East Span of SFOBB. **Mitigation**-Caltrans would comply with the Memorandum of Agreement executed pursuant to the National Historic Preservation Act (see Appendix O).	Same as N-6	Removal of existing East Span of SFOBB and occupation of about 3.0 hectares (7.4 acres) of the 5.9-hectare (14.7-acre) proposed Gateway Park. **Mitigation**-For the loss of the bridge, Caltrans would comply with the Memorandum of Agreement executed pursuant to the National Historic Preservation Act. To minimize harm to the proposed park, Caltrans would replace public shoreline access for loss of proposed parkland.	Substantial modifications to the existing East Span of SFOBB. On YBI, enlarged column would incorporate about 0.001-hectare (0.002-acre) of the grounds of the Senior Officers' Quarters Historic District. **Mitigation**-Caltrans would comply with the Memorandum of Agreement executed pursuant to the National Historic Preservation Act.

Development Trends

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Treasure Island Draft Reuse Plan Consistency **The CCSF has a conceptual proposal under the 1996 Treasure Island Draft Reuse Plan to develop commercial and residential properties on the east side of YBI. The Draft Plan was prepared for the Office of Military Base Conversion, Planning Development, City and County of San Francisco, and the San Francisco Redevelopment Agency.**	Bridge would span 1.1 hectares (2.9 acres) of 3.2 hectares (7.8 acres) of developable land. Air space under bridge could be leased for development by the CCSF per review and approval by Caltrans. The number of live/work units and the size of the conference center would be reduced due to location of bridge footings. Proposed development would require Bay Plan amendments and a federal consistency determination from the Bay Conservation and Development Commission (BCDC) pursuant to the Coastal Zone Management Act. N-6 is consistent with the transportation element of the CCSF reuse plan.	Same as N-6	Bridge would span 0.6-hectare (1.4 acres) of 3.7 hectares (9.1 acres) of developable land; approximately 0.8-hectare (2.0 acres) of land occupied by existing span would become available for development. Otherwise, same as N-6.	No permanent impacts on the CCSF's redevelopment concepts described in the 1996 Treasure Island Draft Reuse Plan. Bridge would continue to span 0.2-hectare (0.6-acre) of 3.2 hectares (7.8 acres) of developable land.

Development Trends (continued)				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Port of Oakland **BCDC amended its Seaport Plan and Bay Plan in January 2001, which included the deletion of the port priority use area at the Bay Bridge Site (Oakland Touchdown area).**	No permanent impact on the Port of Oakland expansion plans.	Same as N-6	Same as N-6	Same as N-6
Oakland Touchdown Area Proposed Gateway Park **Reuse plan of Oakland Base Reuse Authority (OBRA) has designated 5.9 hectares (14.7 acres) at the Oakland Touchdown area as a future public park. Led by East Bay Regional Park District, park planning agencies include the City of Oakland, National Park Service, Port of Oakland and BCDC.**	Would not involve use of the proposed Gateway Park. At the closest point, the bridge structure would be approximately 46 meters (151 feet) from the OBRA-designated park boundary.	Same as N-6	The structure would bisect and occupy 3.0 hectares (7.4 acres) of 5.9 hectares (14.7 acres) from the OBRA-designated park.	Would not involve use of proposed Gateway Park. At the closest point, the bridge structure would be approximately 30 meters (98 feet) from the OBRA-designated park boundary.
BDCD Permit 11-93 **As part of the I-880/Cypress Freeway Replacement Project, Caltrans is required to provide public access to the Bay at the Oakland Touchdown area. These access areas, or overlooks, and other improvements are required by BCDC to maximize public access to the west end of the Oakland Touchdown area.**	Consistent with Permit 11-93 as amended. Pursuant to the amended permit, the final location and design of public access improvements would be jointly planned in coordination with the East Span Project subject to BCDC approval. Should it prove infeasible to construct some or all of the improvements required under Permit 11-93, Caltrans may pay BCDC an in-lieu fee.	Same as N-6	Same as N-6	Same as N-6

Transportation				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Vehicular Transportation	Would retain five eastbound and five westbound traffic lanes on the East Span. No long-term impacts to local traffic, transit, or maritime traffic. Addition of shoulders may reduce non-recurrent congestion caused by accidents or stalls and would result in fewer lane closures for maintenance operations. The existing Caltrans maintenance road at the Oakland Touchdown area would be realigned but there would be no loss of access.	Same as N-6	Same as N-6; however S-4 would require modification of existing access patterns on the local roadways of the Oakland Touchdown area. Realigned access roadways would serve existing facilities and future park development, with the exception of the EBMUD dechlorination facility where restricted access would require relocation of the service road and/or dechlorination facility. (Mitigation for this impact is discussed in the Community Services section on page S-22).	Traffic operations would remain the same as under existing conditions.
Non-Motorized Traffic: Bicycles and Pedestrians	Provision of bicycle/pedestrian path between Oakland and YBI would be consistent with the CCSF's Treasure Island Draft Reuse Plan, BCDC's Bay Plan, City of Oakland's Pedestrian and Bicycle Master Plan and Association of Bay Area Government's Bay Trail Plan.	Same as N-6	Same as N-6	Would not implement a bicycle/pedestrian path on East Span and is therefore inconsistent with local plans listed under N-6.
Parking on YBI and the Oakland Touchdown area	No impact	No impact	No impact	No impact
Marine Traffic	No impact	No impact	No impact	No impact
Air Traffic	Would change existing obstruction markings and lighting. Federal Administration (FAA) form 7460-1, "Notice of Proposed Construction or Alteration," would be filed with the FAA, which would disclose the location and height of a cable-supported tower. Warning lights are required because the tower would exceed 61 meters (200 feet), which is FAA's maximum height for which warning lights are not required.	Same as N-6	Same as N-6	No impact

Visual				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Removal of Vegetation and Slope Disturbance on Yerba Buena Island and the Oakland Touchdown Area	The appearance of the hillside to the south of the East Span may be permanently altered, and approximately 350 mature trees (mostly eucalyptus) on eastern facing slopes of YBI and 71 mature trees (mostly pine) at the Oakland Touchdown area would be removed. **Mitigation-** Caltrans would approve a construction access plan detailing grading, access roads, vegetation removal, and location of equipment platforms. Construction limits on YBI would protect select vegetation and screening to the maximum extent feasible. A re-vegetation plan would include the planting of mature trees, monitoring, and replanting as necessary to return disturbed acres to a natural appearance and to establish visual screening of the bridge. Re-planted vegetation would require approximately ten years to reestablish itself to current density. Caltrans would develop a master-planting plan in coordination with local agencies to be implemented within two years after bridge construction is completed.	Same as N-6	Construction would result in removal of approximately 325 mature trees at YBI (mostly eucalyptus) and approximately 12 mature trees at the Oakland Touchdown area (mostly pine). **Mitigation-**Same as N-6	Construction would result in removal of approximately 150 mature trees at YBI (mostly eucalyptus). **Mitigation-**Same as N-6
Visual Image Types	For the main span, the self-anchored design variation would result in the most favorable impact upon visual quality regardless of viewpoint location due to an increase in the vividness of the span and overall unity of the view. The skyway design variation would result in the least favorable impact upon visual quality due to a reduction in the vividness and intactness of the span.	Same as N-6	Same as N-6	Would have a negligible impact on visual quality from distant viewpoints, as the structural elements added to the East Span would not be perceptible. For some of the closer viewpoints, the Retrofit Alternative would have a minimally adverse impact on viewers, as the additional structural elements (new piers and strengthened existing piers) would obstruct views underneath the bridge.

Air Quality

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Permanent Air Quality Impacts	No impact. Project would not increase roadway capacity.	Same as N-6	Same as N-6	Same as N-6

Noise and Vibration

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Noise	On YBI, future predicted peak noise levels at certain locations would exceed FHWA Noise Abatement Criteria (NAC), but would generally decrease by 1 to 14 dBA compared to the existing noise levels. At the Oakland Touchdown area, future users of the proposed Gateway Park could experience slightly higher noise levels (increases of 1-2 dBA) in the eastern portion of the park. Increases of less than 3 dBA are generally not perceptible. Noise levels at the western end of the park would be 3 to 6 dBA lower than existing noise levels.	Same as N-6.	On YBI, peak noise levels at certain locations would exceed FHWA NAC, but would decrease by 1 to 14 dBA compared to the existing noise levels. At the Oakland Touchdown area, future users of the proposed Gateway Park could experience slightly higher noise levels (increases of 2 to 3 dBA) in the eastern portion of the park. These increases should not be perceptible. Noise levels at certain locations in the western end of the park cannot be quantified using the noise model because the bridge would be directly over the area, but the bridge deck would likely shield the area from traffic noise on the structure above.	No change from existing noise levels.
Noise on the bike/pedestrian path	Future predicted noise on the path would be approximately 82-84 dBA. Exposure to typical noise levels on the bridge would not cause hearing problems for path users.	Same as N-6	Same as N-6	Retrofit Alternative would not include a bicycle/pedestrian facility.

Noise and Vibration (continued)

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Vibration	Vibration levels from traffic operations (i.e. heavy-truck traffic) would probably be below the levels of human perception at distances of more than 30 meters (100 feet) from bridge support columns. Vibration levels at nearby locations, including the film studios on TI, are predicted to remain below architectural damage criterion and human perception levels.	Same as N-6	Same as N-6	Same as N-6; however vibration levels may be slightly than those resulting from replacement alternatives because this alternative would not include use of higher-mass concrete on bridge decks.

Hazardous Waste Sites

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Hazardous Waste Sites and Materials	May impact eight hazardous waste sites on YBI and three on the Oakland Touchdown area. **Mitigation-**Off-site disposal would be at an appropriate landfill or recycling facility. Licensed waste haulers would transport hazardous soil.	Same as N-6 **Mitigation-**Same as N-6	May impact nine hazardous waste sites on YBI and four on the Oakland Touchdown area. **Mitigation-**Same as N-6	May impact five hazardous waste sites on YBI and two on the Oakland Touchdown area. **Mitigation-**Same as N-6

Geology, Soils and Seismicity				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Soil and Rock Stability Settlement	Pre-existing slope stability and erosion problems on YBI adjacent to the USCG facility. An incident of slope failure could interfere with USCG operations by obstructing the USCG road next to the facility. In addition, a temporary road would be required through an existing slope approximately 35 meters (115 feet) south of Building 206 and Quarters 8. **Mitigation-** Caltrans would ensure that the project does not exacerbate pre-existing problems within Caltrans' right-of-way or its temporary construction easement during or after construction. Consultation with the USCG and collection of information on slope stability prior to and during construction would be conducted. Caltrans will require the contractor to prepare a conceptual plan for slope stability and erosion control on the hillside above the USCG facility and solicit comments on the plan from the USCG. In order to minimize slope impacts associated with the temporary road, temporary retaining walls would be used. Excavation required for construction of the walls would be filled in. At the Oakland Touchdown area, the potential for liquefaction of the fill that lies beneath the water table exists. **Mitigation-**At-grade approach structures would be created by placing embankment fill on certain sections of the landfall that may be prone to settlement.	Same as N-6	Same as N-6	No impact

Geology, Soils and Seismicity (continued)

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Seismicity	Meets lifeline criteria. Expected to withstand an MCE on the San Andreas or Hayward fault. Design criteria include non-collapse and serviceability of structures when subjected to ground motions during a seismic event.	Same as N-6	Same as N-6	Does not meet lifeline criteria. It is expected that the retrofitted main span would withstand an MCE or smaller event however it is anticipated that in the event of an MCE, the retrofitted East Span would experience damage to truss members in the steel superstructure.
Tsunamis	The structural design on the Oakland Touchdown area would include the capability of resisting water/wave/current-induced loading.	Same as N-6	Same as N-6	Same as N-6

Water Quality

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Water Quality	Not expected to increase concentration levels of pollutants commonly found in highway runoff nor is the design expected to elevate the levels of less common constituents. A reduction in sandblasting and painting operations and use of non-lead based paint on steel portions of the new span would decrease discharge of lead debris and residue into the Bay. Addition of shoulders would improve response time for emergency vehicles, maintenance crews and hazardous spills response teams, minimizing discharges into the Bay. No impacts to ground water quality.	Same as N-6	Same as N-6	No impact. The current practice of sweeping the bridge decks would continue and storm water would continue to discharge directly into the Bay.

Permanent Change in Volume and Area of Other Waters of the U.S. as defined by ACOE

Under the Clean Water Act, the ACOE considers fill in Other Waters of the U.S. to be solid material placed in jurisdictional waters below the Mean High Water Line (MHW), which is approximately +1.42 meters National Geodetic Vertical Datum (NGVD) (+4.63 feet) at Yerba Buena Island and the Oakland touchdown area. The analysis of fill in Other Waters of the U.S. does not include fill in special aquatic sites. Impacts to special aquatic sites are addressed separately.

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Change in Volume to Other Waters of the U.S.	Would result in a net increase of 386,000 cubic meters (504,900 cubic yards).	Same as N-6	Would result in a net increase of 368,300 cubic meters (481,700 cubic yards).	Would result in a net decrease of 26,300 cubic meters (34,200 cubic yards).
Change in Surface Area to Others Waters of the U.S.	Would result in a net decrease of 0.26 hectare (0.63 acre).	Same as N-6	Would result in a net decrease of 0.93 hectare (2.31 acre).	Would result in a net decrease of 1.70 hectare (4.19 acre).

Permanent Change in Volume and Area of San Francisco Bay as defined by BCDC

Under the McAteer-Petris Act, BCDC considers Bay fill to be any solid, pile-supported, floating, cantilevered or high-level suspended material that is placed bayward of the Mean High Tide Line (MHTL) which is approximately +0.82 meters NGVD (+2.68 feet) at Yerba Buena Island and +0.84 meters NGVD (+2.77 feet) at the Oakland Touchdown area. Unlike the ACOE, the analysis of fill under BCDC's jurisdiction includes fill in special aquatic sites such as wetlands, eelgrass beds and sand flats.

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Change in Volume of the Bay	Would result in a net increase of 352,400 cubic meters (460,900 cubic yards).	Same as N-6	Would result in a net increase of 367,500 cubic meters (480,600 cubic yards).	Would result in a net decrease of 16,500 cubic meters (21,300 cubic yards).
Change in Surface Area of the Bay	Would result in a net decrease of 13.96 hectares (34.51 acres).	Would result in a net decrease of 13.03 hectares (32.40 acres).	Would result in a net decrease of 12.30 hectares (30.40 acres).	N/A

Special Aquatic Sites

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Sand flats **The sand flats located within the project area are along the north side of the Oakland Touchdown area and along the southeast side of Yerba Buena Island, east of the U.S. Coast Guard facility. Their functions are feeding, and roosting habitat for a variety of shorebirds.**	Permanent impacts to 1.36 hectares (3.36 acres) at the Oakland Touchdown area. **Mitigation-**On-site restoration of a portion of sand flats following construction; off-site creation of tidal marsh ecosystem.	Same as N-6	Permanent impacts to 0.01 hectare (0.03-acre) at YBI. **Mitigation-**Off-site creation of tidal marsh ecosystem.	No impact

Special Aquatic Sites (continued)

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Eelgrass Beds **Five areas of eelgrass beds have been identified in the project area. There are two on the north shore of YBI, two on the south shore of YBI and one on the north shore of the Oakland Touchdown area. Their functions are food source, nursery, spawning ground, and/or habitat for resident and migratory species of birds, fish, and invertebrates.**	Permanent impacts to 0.21-hectare (0.52 acre) at the Oakland Touchdown area and 0.01-hectare (0.03 acre) at YBI. **Mitigation-**Minimization of impacts through a turbidity control program; harvesting eelgrass from the barge access channel and replanting in adjacent beds as a pilot program; restoring bathymetry of portions of barge access channel and replanting with eelgrass to facilitate eelgrass colonization; off-site creation of tidal marsh ecosystem.	Same as N-6	Permanent impacts to 0.16-hectare (0.40-acre) at YBI. **Mitigation-**Minimization of impacts through a turbidity control program; harvesting eelgrass from the barge access channel at YBI and replanting it in adjacent beds as a pilot program; restoring bathymetry of portions of barge access channel and replanting with eelgrass to facilitate eelgrass colonization; off-site creation of tidal marsh ecosystem.	No impacts
Wetlands **The tidal wetlands in the project study area possess a moderate level of functions and values since they are remnant wetlands surrounded by non-native species that do not provide extensive habitat for wildlife. The two non-tidal wetlands in the project area possess very limited functions and values due to the lack of wetland species diversity and human disturbance.**	No impact Avoidance of habitat by marking the wetlands as Environmentally Sensitive Areas (ESAs)	Same as N-6	Permanent impacts to 0.05-hectare (0.12-acre) of non-tidal wetlands on the south side of the Oakland Touchdown area from construction. **Mitigation-**Off-site creation of non-tidal wetlands.	Same as N-6

Special Status Species

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Double-Crested Cormorant **Protected by Migratory Bird Treaty Act.**	Dismantling the existing structure would remove nesting sites. **Mitigation-**Nesting habitat would be constructed on the new bridge.	Same as N-6	Same as N-6	No impact
Peregrine Falcon **Removed from Federal Endangered Species List. Protected by State Endangered Species Act and Migratory Bird Treaty Act.**	Dismantling the existing structure would remove nesting site. **Mitigation-**None required: peregrine falcon is likely to nest on a replacement bridge. Santa Cruz Predatory Bird Research Group would continue monitoring and off-site release efforts to avoid potential impacts during scheduled maintenance activities.	Same as N-6	Same as N-6	No impact

Other Natural Communities

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Shorebird Habitat	Would result in a small loss of sand flats that provide shorebird foraging and roosting habitat on the north side of the Oakland Touchdown area. However, due to the small area impacted, it is not anticipated that this will adversely impact shorebirds. **Mitigation-**See construction period mitigation.	Same as N-6	Would result in a small loss of upland area on the south side of the Oakland Touchdown area that is known to provide roosting habitat for shorebirds during the winter months. **Mitigation-**See construction period mitigation.	No impact
Coast Live Oak Woodlands	Would result in the loss of six coast live oak trees on YBI. **Mitigation-**Replacement of trees per the CCSF tree ordinance at a 3:1 ratio. Due to the root structure of mature oak trees, the replacement trees may be smaller than those displaced.	Same as N-6	Same as N-6	No impact

Historic Properties

In accordance with Section 106 of the National Historic Preservation Act, measures to mitigate project effects on historic properties have been stipulated in a Memorandum of Agreement (MOA) among the Federal Highway Administration (FHWA), U.S. Coast Guard, the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP), with Caltrans as a concurring party. The Navy, local governments, and Native Americans were also asked to participate in the development of mitigation measures and invited to sign the MOA as concurring parties. Mitigation measures for the impacts below are identified in the MOA (Appendix O). The following discussion includes permanent and construction-period impacts.

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Archaeological Site CA-SFr-04/H on YBI	Columns for eastbound and westbound permanent structures and one column for the westbound temporary detour would disturb site.	No impact	North half of site removed due to westbound temporary detours. **Mitigation-**Same as N-6	Excavation to strengthen Column YB3 would disturb site. **Mitigation-**Same as N-6
Building 262 (Torpedo Building)	Impact due to "visual, audible, or atmospheric elements that are out of character with the property." In addition, construction activities in the vicinity and overhead could result in inadvertent damage.	Same as N-6	No impact	No impact
Senior Officers' Quarters Historic District (includes Quarters 1 to 7 and Buildings 83, 205, and 230).	Views from Quarters 1 would be slightly modified by placement of a concrete column and removal of existing steel column. Footings for temporary detours would be constructed within the district. The affected areas would be restored to their prior condition at the completion of the project.	Same as N-6	Would not modify the views from Quarters 1, otherwise same as N-6.	The encasement of steel columns in concrete at Piers YB2 through YB4 would introduce a visual intrusion.
Quarters 8, 9, 10 and Building 267 (garage associated with Building 10).	No impact	Same as N-6	Same as N-6	Same as N-6
Existing East Span of SFOBB	Removal of bridge and two ancillary buildings (Caltrans garage and electric substation on YBI).	Same as N-6	Same as N-6	Alteration of bridge.
Key Pier Substation (Oakland Touchdown area)	Removal of existing East Span, to which substation contributes; station itself not removed or altered, but its historic association with the SFOBB would be lost.	Same as N-6	Same as N-6	No impact

Scientific Resources

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Scientific Resources	Potential for disturbance of paleontologic resources during in-Bay construction of new piers and footings. **Mitigation-**Should paleontological resources be discovered, Caltrans would ensure that the provisions of the California Public Resources Code Section 5097.6 are implemented using their "Interim Guidance for the Identification, Assessment, and Treatment of Paleontological Resources," July 1991.	Same as N-6	Same as N-6	Potential for disturbance of paleontologic resources during in-Bay construction to retrofit existing piers and footings. **Mitigation-**Same as N-6

Utilities

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Impacts to Utilities	Utilities on the existing East Span would be relocated to the replacement span. Caltrans or the utility owner will pay relocation costs depending on agreements made prior to relocation. Submarine utilities would be avoided to the greatest extent possible. If utilities cannot be avoided, they would be protected in place or relocated. Caltrans and the contractor would assume responsibility for damage and payment for documented income loss and difference in power costs. A temporary span of the land portion of the EBMUD outfall facility may be required and would be coordinated with EBMUD.	Same as N-6	Same as N-6; however a special bridge design would be required to sufficiently span the outfall facility in order to prevent construction period damage.	Utilities on the existing East Span would be maintained. Otherwise, same as N-6.

Energy				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Energy	No long-term impacts.	Same as N-6	Same as N-6	Same as N-6

Construction Period Impacts

The following are construction period impacts which would occur during construction of a replacement or retrofit alternative. These impacts are temporary and are not anticipated to have environmental impacts beyond completion of the project.

Construction Period Community Impacts				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Community Impacts	The desirability of Quarters 1-7 would be reduced during construction due to noise, lighting, and visual impacts of construction. Building 262, currently vacant and in disrepair, would be accessible but would not be usable due to adjacent construction activity. **Mitigation-**Caltrans would reimburse the CCSF for documented losses in rental income from Quarters 1- 7. A pre- and post-construction survey of Quarters 1- 7 and Building 262 would be conducted and construction-related damage would be repaired as necessary. Protective measures would be developed in consultation with property owners.	Same as N-6	Same as N-6	Same as N-6; however, causes for motorist delays on YBI and the Oakland Touchdown would be limited to the use of local streets for transport of workers, equipment, and materials.

Construction Period Community Impacts (continued)

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Safety and Security	Heavy vehicle movements, possible hazardous waste excavation and transport, and construction site activity could create safety concerns for construction workers and members of the public on YBI and the Oakland Touchdown. **Mitigation-**Best construction management practices would be in place to ensure the safety of construction workers, local employees, and residents during construction.	Same as N-6	Same as N-6	Same as N-6
Temporary use of Resources Protected by Section 4(f) of the Department of Transportation Act	On YBI, four to six column footings of a temporary detour would be placed in landscaped or paved areas of the Officers' Quarters Historic District. **Mitigation-**Caltrans would protect historic buildings in the senior Officers' Quarters Historic District during construction and restore disturbed areas following construction.	Same as N-6	Same as N-6	No impact

Construction Period Transportation Impacts

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Impacts to traffic on the East Span	Lane or bridge closures would be necessary to connect the new structure and the existing viaduct at YBI. These closures could result in some traffic delays on the East Span and its approaches. Additional delays could occur as "rubbernecking" drivers watch construction of the new superstructure and dismantling of the existing bridge from the new bridge. **Mitigation**-Caltrans is continuing to investigate lane and bridge closures in an effort to simultaneously minimize public inconvenience, facilitate construction and maximize public safety. Closures would be timed during off-peak hours to the extent feasible and Caltrans would implement a traffic management plan to manage impacts to traffic.	Same as N-6	Same as N-6	Would result in longer and more frequent lane closures (i.e., almost every day during the construction period), compared to the replacement alternatives. **Mitigation**-Same as N-6

Construction Period Transportation Impacts (continued)				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Impacts to Traffic Circulation on YBI	Occasional congestion could occur on YBI due to construction-related vehicle traffic on local roadways, an increase in the volume of vehicles entering and exiting the island, closure of westbound on-ramp and eastbound off-ramp on the east side of the island, closure of Southgate Road, and modifications to the USCG access road, Macalla Road, and the road that provides access to Building 262. Also, there would be no public access to the parade grounds and a temporary restriction of access to Building 267 (the garage at Quarters 10), for about a day. **Mitigation-**The contractor would construct a detour around the column foundations to keep Macalla Road open or provide another travel way for USCG personnel and column construction could be staged so that entrances to the USCG Station would be open at all times. Temporary detours would be constructed and flaggers employed to ensure motorist safety for USCG vehicles in the construction zone. Barges would deliver wide and oversized construction loads, where possible. Caltrans would limit contractor parking to the temporary construction easement.	Same as N-6	Same as N-6	Same as N-6; however, would not restrict access to Building 267.
Impacts to pedestrian circulation on YBI	Would displace stairway linking USCG facility with bus stop on SFOBB. **Mitigation-**Caltrans would construct new stairway after consulting with USCG, Navy, and the CCSF about appropriate site. Construction-period shuttle service would be provided.	Same as N-6	No long-term impact on stairway linking USCG facility with bus stop on SFOBB. Stairway would be closed during construction. **Mitigation-**Construction-period shuttle service would be provided.	Construction may require the temporary closure of stairway linking USCG facility with the bus stop on SFOBB. **Mitigation-** Construction-period shuttle service would be provided in the event of a closure.

Construction Period Transportation Impacts (continued)				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Impacts to Traffic Circulation on the Oakland Touchdown area	Would require closure of access road on north side of I-80, eliminating shoreline access for authorized vehicles west of Radio Point Beach. Construction-related vehicle traffic could potentially cause minor delays to other traffic and two AC Transit lines. No mitigation is recommended for potential minor delays.	Same as N-6	Same as N-6; however, would not require closure of shoreline access road used by authorized vehicles.	Same as S-4
Marine Operations	Non-project-related marine traffic would be diverted from areas of construction. Barges, other construction vessels, and falsework would restrict the navigation opening. Temporary closures of portions of the navigation opening could occur. **Mitigation**-Caltrans would consult with the USCG to implement a vessel warning system for periods when construction vessels are placed in the water within the bridge construction zone. Notification to mariners and other requirements will be specified in the permit completed for the USCG.			

Construction Period Visual Impacts				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Visual Impacts on YBI	Visual changes for residents and users of YBI due to location of temporary detour columns, construction staging, lighting equipment and the reduction of some Bay views from Quarters 1-7. Changes would not substantially alter the character of the Bay or YBI. **Mitigation-**To reduce glare from lighting used during nighttime construction activities, Caltrans would require contractor to direct lighting onto the immediate area under construction only and avoid shining lights toward residences and marine traffic.	Same as N-6	Same as N-6	Same as N-6, including possible visual impacts from the use of scaffoldings.
Visual Impacts on the Oakland Touchdown area	Visual changes due to construction activities and staging.	Same as N-6	Same as N-6	Same as N-6

Construction Period Air Quality Impacts

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Air Quality Impacts	Would contribute to area air pollutants emissions during most stages of construction. The largest sources of anticipated pollutants would be dust generated by excavation, grading, and other ground disturbing activities on YBI and the Oakland Touchdown area and exhaust emissions from equipment and marine vessels. Because emissions would vary from day to day depending on construction activity, construction location, and distance to receptors, an exact estimate of total construction emissions and impacts are not possible. Measures to reduce emissions during construction, as specified in Caltrans' Standard Specifications, would be included in the contract specifications. These measures include: watering exposed soil surfaces, covering trucks transporting dust producing material, reducing-construction vehicle travel speeds on unpaved surfaces, maintaining equipment per manufacturers' specifications and conforming to all air pollution regulations. Because these measures will be included in the contractor specifications, no mitigation is proposed.	Same as N-6	Same as N-6	Same as N-6

Construction Period Noise and Vibration Impacts

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Noise Impacts	During construction of the temporary eastbound detour, noise levels at Bachelor Enlisted Quarters may increase by ten dBA over existing conditions. During pile driving operations, noise levels at Quarters 8, the Bachelor Enlisted Quarters Building 240, and Building 262 may increase by 19-20 BA and 7 dBA at the Treasure Island film studios. **Construction-period Noise Abatement-**All construction equipment would conform to provisions in Section 7-1.01I of the latest edition of Standard Specifications. The contractor would be required to comply with local noise control ordinances to the extent practicable. Caltrans would continue to consult with the Coast Guard to identify and implement feasible and reasonable measures to reduce construction-related noise levels at USCG facilities. In addition, Caltrans is continuing to investigate the possibility of limiting the hours for pile driving to reduce the construction noise impacts to other residents of YBI and TI.	Same as N-6	Same as N-6	During rivet removal operations, noise levels at USCG Building 40 (administration) and Navy Building 213 (storage for 1 fire truck) may increase by 3-16 dBA over existing conditions. Pile driving would occur in closest proximity to Quarters 1 and noise levels at that location might increase by 24 dBA. **Construction-period Noise Abatement-**Same as N-6.
Traffic Noise from temporary detours associated with Replacement Alternatives	Noise generated by detour traffic is anticipated to be similar to noise from existing traffic. Slight increases of 1-2 dBA at certain locations would generally not be perceptible.	Same as N-6	Same as N-6	No detours structures required.

Construction Period Noise and Vibration Impacts (continued)

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Vibration Impacts	Due to distance of buildings from construction activities, no architectural damage is expected to occur as a result of vibrations. Due to distance from construction activities, vibrations should not be perceptible at the Treasure Island film studios. **Abatement-**Historic properties on YBI would be monitored for construction related damage including the use of vibration measuring devices on buildings. Caltrans would photographically document the condition of these buildings prior to the start of construction to establish the baseline condition. Any damage to the buildings resulting from construction activities would be repaired in accordance with the Secretary of the Interior's Standards for Rehabilitation.	Same as N-6	Same as N-6	Same as N-6

Construction Period Hazardous Material Impacts

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Hazardous Wastes and Materials	Construction workers or public may be exposed to contaminated soil, groundwater, lead-based paint and asbestos during grading, excavation, and dismantling of existing bridge. **Mitigation-**Construction and dismantling of all structures would include procedures for the identification, abatement, handling, and disposal of contaminated materials, as well as worker health and safety. All procedures would be consistent with Caltrans' guidelines and all federal, state and local laws and regulations.	Same as N-6	Same as N-6	Same as N-6

Construction Period Impacts to Water Resources and Water Quality				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Water Quality	Potential impacts from construction activities include but are not limited to: groundwater contamination from excavations; surface water impacts from dredging and dewatering, concrete placement and washout activities, management and application of chemical products; construction activities performed on barges; use of floating batch plants; and accidental spills from construction equipment and materials. **Mitigation-**A Storm Water Pollution Prevention Program (SWPPP) would be prepared to identify pollutant sources that may affect the quality of the discharges of storm water associated with the construction activities of the project and to identify and implement storm water pollution control measures to reduce pollutants in storm water discharges. The objectives of the SWPPP would be to minimize the degradation of off-site receiving waters to the maximum extent practicable with the current Best Management Practices (BMPs) for the construction industry and to reduce the mass loading of chemicals and suspended solids to the downstream drainage system and the receiving water bodies.	Same as N-6	Same as N-6	Same as N-6; however, because the existing structure would not be dismantled, a separate SWPPP for dismantling would not be required.

Temporary Change in the Volume and Area of Other Waters of the U.S. as defined by ACOE

Under the Clean Water Act, the ACOE considers fill in Other Waters of the U.S. to be solid material placed in jurisdictional waters below the Mean High Water Line (MHWL), which is approximately +1.42 meters NGVD (+4.63 feet) at Yerba Buena Island and the Oakland touchdown area. The analysis of fill in Other Waters of the U.S. does not include fill in special aquatic sites. Impacts to special aquatic sites are addressed separately.

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Change in Volume to Other Waters of the U.S.	Would result in a net decrease of 41,000 cubic meters (54,000 cubic yards).	Same as N-6	Would result in a net decrease of 45,000 cubic meters (58,000 cubic yards).	Would result in a net decrease of 13,000 cubic meters (17,000 cubic yards).
Change in Surface Area to Others Waters of the U.S.	Would result in a net decrease of 0.80 hectare (1.97 acre).	Same as N-6	Would result in a net decrease of 1.05 hectare (2.59 acre).	Would result in a net decrease of 0.36 hectare (0.90 acre).

Temporary Change in the Volume and Area of San Francisco Bay as defined by BCDC

Under the McAteer-Petris Act, BCDC considers Bay fill to be any solid, pile-supported, floating, cantilevered or high-level suspended material that is placed bayward of the Mean High Tide Line (MHTL) which is approximately +0.82 meters NGVD (+2.68 feet) at Yerba Buena Island and +0.84 meters NGVD (+2.77 feet) at the Oakland Touchdown area. Unlike the ACOE, the analysis of fill under BCDC's jurisdiction includes fill in special aquatic sites such as wetlands, eelgrass beds and sand flats.

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Change in Volume of the Bay	Would result in a net increase of 48,000 cubic meters (63,000 cubic yards).	Same as N-6	Would result in a net increase of 42,000 cubic meters (54,000 cubic yards).	Would result in a net decrease of 12,000 cubic meters (15,000 cubic yards).
Change in Surface Area of the Bay	Would result in a net decrease of 7.12 hectares (17.6 acres).	Would result in a net decrease of 7.07 hectares (17.48 acres).	Would result in a net decrease of 6.25 hectares (15.44 acres).	Would result in a net decrease of 0.05 hectares and (0.13 acres).

Construction Period Impacts to Special Aquatic Sites

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Sand flats **The sand flats located within the project area occur along the north side of the Oakland Touchdown area and along the southeast side of Yerba Buena Island, east of the U.S. Coast Guard facility. Their functions are foraging and roosting habitat for a variety of shorebirds.**	Placement of a geotube for dewatering would impact approximately 0.69 hectare (1.70 acres) of sand flats along the north shore of the Oakland Touchdown area, resulting in a small reduction in roosting and feeding habitat for shorebirds. **Mitigation-**On-site restoration of portions of sand flats following construction; off-site creation of tidal marsh ecosystem would include enhancement or creation of upland refugia for shorebirds.	Same as N-6	Trestles would temporarily impact 0.01 hectare (0.02 acre) along the south shore of YBI. **Mitigation-**Same as N-6	No impact

Construction Period Impacts to Special Aquatic Sites (continued)

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Eelgrass Beds **Five areas of eelgrass beds have been identified. There are two on the north shore of YBI, two on the south shore of YBI and one on the north shore of the Oakland Touchdown area. Their functions are food source, nursery, spawning ground, and/or habitat for resident and migratory species of birds, fish, and invertebrates.**	Temporary impacts to 0.01 hectare (0.02 acre) of eelgrass at the Oakland Touchdown area from turbidity associated with dredging, pile driving, and barge maneuvering. **Mitigation-**Would include utilization of dredge types and techniques that minimize turbidity and implementation of a turbidity control program; marking eelgrass beds outside access channel as Environmentally Sensitive Areas (ESAs); harvesting eelgrass from within the barge access channel and replanting in adjacent beds as a pilot program; restoring bathymetry of portions of barge access channel and replanting with eelgrass to facilitate eelgrass colonization; off-site creation of tidal marsh ecosystem.	Same as N-6	Same as N-6	No impact
Wetlands **The tidal wetlands in the project study area are located along the north shore of the Oakland Touchdown area and the north side of Yerba Buena Island. These wetlands possess a moderate level of functions and values. The two non-tidal wetlands on the south side of the Oakland Touchdown area possess very limited functions and values due to the lack of wetland species diversity and human disturbance.**	Caltrans would avoid potential construction period impacts to the tidal wetlands at the Oakland Touchdown area and Yerba Buena Island and the two isolated non-tidal wetlands at the Oakland Touchdown area by designating them as Environmentally Sensitive Areas (ESAs).	Same as N-6	Tidal wetlands at YBI would be marked as ESA's. No construction-period impacts to non-tidal wetlands at the Oakland Touchdown. For permanent impacts, see page S-33. **Mitigation-**Off-site creation of non-tidal wetlands.	Same as N-6

Construction Period Impacts to Wildlife

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Peregrine falcon **Removed from Federal Endangered Species List. Protected by State Endangered Species Act and Migratory Bird Treaty Act.** **Mitigation would apply even though the falcon has been delisted.**	Construction activities could impact breeding and nesting. **Mitigation-**The Santa Cruz Predatory Bird Research Group would monitor the birds during their nesting period and if they show signs of disturbance during construction or dismantling operations, the eggs and/or chicks would be collected, raised off-site and eventually released at a natural site such as Point Reyes.	Same as N-6	Same as N-6	Same as N-6
Double-Crested cormorant and the Western Gull **Protected by Migratory Bird Treaty Act.**	If cormorants or gulls nest within construction work areas, nests could be disturbed during construction. **Mitigation-**Caltrans would prevent nesting on the new span during construction.	Same as N-6	Same as N-6	Same as N-6
Black-crowned Night Heron, Allen's hummingbird, white-tailed kite, bank swallow, and Bewick's wren	Vegetation and tree removal on YBI may impact nesting on YBI. **Mitigation-**Prior to the removal of vegetation and trees, a biological monitor would survey for nests. Vegetation and trees with nests or those adjacent to areas with nests would not be removed until the nesting is complete or to the extent feasible, vegetation and trees that need to be removed could be removed prior to the nesting season.	Same as N-6	Same as N-6	Same as N-6
Shorebirds	Construction period impacts to sand flats would cause a reduction in roosting and feeding habitat for shorebirds. In addition, a small portion of upland roosting habitat located on the south side of the Oakland Touchdown area would be temporarily displaced for use as a construction staging area. **Mitigation-**See mitigation for construction period impacts to sand flats.	Same as N-6	Same as N-6	A small portion of upland roosting habitat located on the south side of the Oakland Touchdown area would be temporarily displaced for use as a construction staging area. **Mitigation-**Same as N-6.

Construction Period Impacts to Wildlife (continued)				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
California sea lion and harbor seal **California sea lions and harbor seals are protected from harassment under the Federal Marine Mammal Protection Act.**	Noise from pile driving may disturb harbor seals and sea lions when they are foraging in the area. Marine mammals swimming in the project vicinity would be temporarily displaced if they chose to avoid the area. **Mitigation-**Appropriate mitigation would be developed as necessary in coordination with National Marine Fisheries Service (NMFS) such as establishing a safety zone around pile driving activities and sound attenuation during pile driving.	Same as N-6	Same as N-6	Same as N-6
Gray Whale	Noise from the pile driving activity may disturb or impact the behavior of gray whales passing through the project vicinity. It is likely that whales will avoid the pile driving area during the 3-month period in which they are observed in the Bay. **Mitigation-**See mitigation for California sea lion and harbor seal.	Same as N-6	Same as N-6	Same as N-6
Chinook salmon, Steelhead, Green sturgeon, and Longfin smelt **Steelhead are threatened under the Federal Endangered Species Act. Green sturgeon and longfin smelt are state and federal species of concern. Winter-run Chinook salmon are endangered at federal and state level. Spring-run is listed as federally proposed endangered. Fall-run is listed as proposed threatened at the federal level.**	Potential increased turbidity and resuspended contaminants in water column due to dredging, pile driving, barge maneuvering, and trestle and cofferdam construction. Increased amounts of sediment in water could lower dissolved oxygen levels and adversely affect oxygen uptake by fish. **Mitigation-** Implementation of a turbidity control program. If construction sequencing permits, dredging would be avoided in shallow water during the peak juvenile out migration period (January 1 through May 31).	Same as N-6	Same as N-6	Same as N-6

Construction Period Impacts to Wildlife (continued)				
Impact Category	**Replacement Alternative N-6**	**Replacement Alternative N-2**	**Replacement Alternative S-4**	**Retrofit Existing Structure Alternative**
Pacific herring **Pacific herring is a commercially important fish in San Francisco Bay monitored by California Department of Fish and Game.**	Acoustical impacts and turbidity could affect winter spawning. **Mitigation**-A qualified biologist would monitor construction during the spawning period (January to March). If spawning is observed in the project area, in-water activities such as dredging would be suspended within 200 meters (656 feet) of spawning and not resume for a period of up to 14 days. Would include utilization of dredge types and techniques that minimize turbidity, and implementation of a turbidity control program.	Same as N-6	Same as N-6	Same an N-6
Fish (in General)	Pile driving may have impacts on fish within the immediate vicinity. During the PIDP, injury and mortality of small fish (anchovies, herring, and perch) were observed within the immediate vicinity of pile driving operations. **Mitigation**-Noise attenuation measures would be used for any pile driving during the peak juvenile salmon outmigration period that will protect the non-salmonid species as well.	Same as N-6	Same as N-6	Same as N-6

Construction Period Impacts to Cultural Resources

Discussed under permanent impacts to Cultural Resources identified earlier in the table.

Construction Period Excavation and Dredging

The Dredged Material Management Office (DMMO) approved the Sampling and Analysis Plan (SAP) and the Sediment Sampling and Analysis Report (SAR). The purpose of the plan and report was to collect and analyze sediment samples from new pier locations and access dredging necessary for Replacement Alternative N-6. Additional sediment characterization may be required by the DMMO if an alternative other than Replacement Alternative N-6 is selected. For all replacement alternatives, the sediments in the barge access channel for dismantling the existing bridge would need to be characterized in the future. The Dredged Material Management Plan describes reuse/disposal of materials and can be found in Appendix M. The determination of the DMMO concerning reuse/disposal sites is discussed in Section 4.14.10-Construction Excavation and Dredging.

Impact Category	Replacement Alternative N-6	Replacement Alternative N-2	Replacement Alternative S-4	Retrofit Existing Structure Alternative
Estimated Dredged Quantities	Total estimated volume is 413,000 cubic meters (540,000 cubic yards).	Same as N-6	Total estimated volume is 417, 000 cubic meters (545,000 cubic yards).	Total estimated volume is 116,000 cubic meters (152,000 cubic yards).

CHAPTER 1
PURPOSE OF AND NEED FOR PROJECT

1.1 PROJECT PURPOSE

The purpose of the San Francisco-Oakland Bay Bridge (SFOBB) East Span Seismic Safety Project (East Span Project) is to provide a lifeline[1] vehicular connection that:

- Connects Yerba Buena Island (YBI) in San Francisco and the SFOBB Toll Plaza in Oakland;
- Connects to a lifeline route linking the East Bay, San Francisco, and the San Francisco Peninsula;
- Maintains the current vehicular capacity of the existing East Span;
- Provides for safety of bridge users during a maximum credible earthquake[2] (MCE); and

[1] Lifelines are the systems and facilities that provide services vital to the function of an industrialized society and are critical to the emergency response and recovery after a natural disaster. These systems and facilities include hospitals, fire control and policing, food distribution, communication, electric power, liquid fuel, natural gas, transportation (airports, highways, ports, rail, and transit), water, and wastewater.

Facilities that are determined to be lifeline have extraordinary criteria applied to the design that result in a higher level of operation after a natural disaster. For example, the Uniform Building Code (UBC) divides dwellings into five occupancy categories. The UBC's highest level of importance, "essential facilities", are those defined as lifeline such as surgery and emergency treatment facilities, police and fire stations, aviation control towers, and the like. The design factors for seismic forces and wind loads are increased by 25-50% over the same factors that would be used for dwellings of lesser public importance. The higher importance factors for the essential facilities are then applied to calculations for the design that result in a 25-50% more durable structure. The higher durability is needed for the structure to withstand destructive forces and remain partially or wholly functional in the post-disaster condition.

In the case of the East Span, a lifeline connection would provide for post-earthquake relief access linking major population centers, emergency relief routes, emergency supply and staging centers, and intermodal links to major distribution centers. The East Span would be serviceable soon after an MCE. After inspection by Caltrans personnel, emergency vehicles would be able to travel over the bridge at reduced speeds within hours after a major seismic event. In a few days, with minor repairs, the bridge would be open to the general public (at reduced service; i.e., slower travel speeds).

[2] An MCE is the largest earthquake reasonably capable of occurring, based on current geological knowledge. Caltrans has projected the MCE for the SFOBB East Span as an earthquake of magnitude 8 (Richter scale) on the San Andreas fault or 7¼ on the Hayward fault. The design standard reflected in the DEIS was the MCE approach. However, while earthquakes are often described in terms of their magnitude, they can also be described in terms of their return period, which is the approximate time interval expected between two earthquakes of comparable intensity. Designers of major engineering structures design for an earthquake with a long return period of approximately 1,000 to 2,000 years, called a Safety Evaluation Event (SEE). The design standard for the East Span Project was upgraded to the more stringent SEE standard, meaning that a replacement bridge would be able to withstand a larger earthquake than an MCE. Designers for the East Span Project are using an SEE with a 1,500-year return period in their design criteria for a replacement bridge. This SEE is an earthquake that would generate the largest rock motions expected to occur at the bridge site an average of once every 1,500 years, or ten

- Improves operational and safety design to meet current standards to the greatest extent possible.

The SFOBB East Span Project will provide a seismically upgraded vehicular crossing for current and future users. SFOBB East Span Project replacement bridge alternatives will not preclude a bicycle/pedestrian path.

1.2 NEED FOR PROJECT

The existing East Span must be replaced or retrofitted because it is not expected to withstand an MCE on the San Andreas or Hayward faults, it does not meet lifeline criteria for providing emergency relief access following an MCE, and it does not meet current operational and safety design standards.

The project is proposed to address the following major transportation needs and deficiencies identified specifically on the bridge between YBI and the SFOBB Toll Plaza:

- Lifeline Connection - The existing SFOBB East Span does not provide a lifeline connection that is likely to survive or be usable after an MCE;

- People, Freight and Goods Movement - The existing SFOBB East Span is likely not to allow for high levels of people, freight, and goods movement following an MCE; and

- Current Roadway Design Standards - The existing SFOBB East Span does not meet current roadway operational and safety design standards.

Each of these needs is described in the following sections.

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times the projected 150-year life span of a replacement bridge. The Seismic Safety Peer Review Panel and the Ad Hoc Committee on Seismic Ground Motions (AHC) of MTC's Engineering and Design Advisory Panel (EDAP) considered it appropriate to design a replacement bridge for these ground motions. Furthermore, the AHC evaluated the differences in the ground motions at the bridge site resulting from an MCE and an SEE. On December 7, 2000, the AHC reported its findings to Joseph Nicoletti, Chairman of the EDAP (see Appendix G). In its letter, the AHC said, "In summary, the AHC concludes that the ground motions defined by the SEE response spectra adopted for the replacement bridge design exceed the San Andreas MCE ground motions defined by standard practice at all periods of engineering relevance." Since a replacement bridge would be built to withstand an SEE, which would generate greater motions than an MCE, it would also withstand an MCE. For further discussion of seismic design, see Appendix K.

For purposes of consistency and readability, the FEIS continues to reference the MCE standard; however, the seismic design of a replacement bridge would meet the higher SEE standard. In any event, the MCE standard is subsumed in the SEE standard.

1.2.1 Lifeline Connection - The existing SFOBB East Span does not provide a lifeline connection that is usable after an MCE.

Improvements to the existing East Span are needed to address seismic safety deficiencies and provide a bridge crossing that is usable soon after a major seismic event. It is likely that the existing SFOBB East Span would develop multi-span failures leading to collapse and loss of life in the event of an MCE, even with the recent completion of the interim retrofit project. The East Span does not provide for public safety during an MCE.

Maximum Credible Earthquake

On the basis of research conducted since the 1989 Loma Prieta earthquake, U.S. Geological Survey (USGS) and other scientists conclude that there is a 70 percent probability of at least one magnitude 6.7 or greater quake, capable of causing widespread damage, striking the San Francisco Bay region before 2030. Major quakes may occur in any part of this rapidly growing region. This emphasizes the urgency for all communities in the Bay region to continue preparing for earthquakes.[3]

The seismic design criteria set for the East Span Project have been established as an 8 magnitude earthquake on the San Andreas fault or a 7-1/4 magnitude earthquake on the Hayward fault. The MCE on each of these faults is defined as the largest earthquake that appears to be reasonably capable of occurring based on current geological knowledge. While these values could be exceeded, the values represent the best estimates at this time. The probability of an MCE occurring on one of these faults is approximately one in four over the next two to three decades.[4]

An MCE on either the San Andreas or Hayward fault would be expected to inflict far greater damage to the SFOBB than was experienced from the 1989 Loma Prieta earthquake, during which one section of the upper deck collapsed, killing one person. This is due to the potential for the epicenter of an event on either the San Andreas or Hayward fault to be nearer the bridge, as well as the expected greater magnitude of the MCE compared to that of the Loma Prieta earthquake (magnitude 7.1). It is estimated that an MCE with an 8 magnitude would generate in excess of 30 times more energy than the Loma Prieta earthquake. The feasibility of reopening the existing East Span to traffic following an MCE would be limited or precluded without the seismic safety improvements proposed in the East Span Project.

Lifeline Structure

The SFOBB provides a critical connection between San Francisco, the East Bay, and the I-80 corridor to the east. Designation by the California Department of Transportation (Caltrans) of the SFOBB corridor as a lifeline system connection represents the State's intention to use the SFOBB to provide a high level of post-

[3] U.S. Geological Survey, Major Quake Likely to Strike Between 2000 and 2030, U.S. Geological Survey Fact Sheet 152-99, 1999.
[4] U.S. Geological Survey, Probabilities of Large Earthquakes in the San Francisco Bay Region, California, U.S. Geological Survey Circular 1053, 1990.

earthquake transportation service for emergency response and support for the safety and economic livelihood of the Bay Area. Combined with the West Span seismic retrofit (now under way), the retrofit of the west YBI viaduct and YBI tunnel, and the West Approach replacement, replacement of the East Span would complete the lifeline connection.

The criteria for state lifeline route designation and their applicability to the SFOBB East Span Project are listed below:

- The route provides emergency relief access through or across a potentially impacted region, connecting major population centers within the region - The SFOBB East Span links San Francisco and the San Francisco Peninsula with Oakland and the East Bay;

- For areas with more than one route providing interregional access, the route provides the most effective emergency relief access - The SFOBB, one of five toll bridges crossing San Francisco Bay, provides the shortest and most direct access between the cities of San Francisco and Oakland. The SFOBB provides a high-capacity (10-lane) direct connection between two major Bay Area communities (San Francisco and Oakland);

- The route provides direct or nearby access to and from major emergency response and recovery supply centers and staging areas - The SFOBB provides the most direct access between the medical centers in San Francisco and Oakland and the ports of San Francisco and Oakland; and

- The route provides access to an airport (military or civilian), seaport, major rail facility, or a major distribution center that would be involved in immediate relief activities - The SFOBB provides access to the Port of San Francisco and the Port of Oakland. It is near the Union Pacific Railroad yards at the Port of Oakland. It is part of the lifeline route that provides vehicular access to and from Travis Air Force Base in Fairfield, which would be a major distribution center providing immediate post-earthquake relief.

Cooperative earthquake response planning among Bay Area transportation providers focuses on the roles of agencies, including Caltrans, in post-earthquake response. Emphasis is placed on actions during the first 72 hours after an earthquake. Response scenarios do not call out procedures to be implemented at specified locations. Overall responsibilities for participating agencies are defined.

Caltrans preparedness planning consists of activities, including cooperation with the California Highway Patrol (CHP), in developing traffic control and evacuation procedures; activating emergency response resource centers; and establishing route recovery plans.[5]

[5] Association of Bay Area Governments, Riding Out Future Quakes (www.abag.ca.gov/bayarea/eqmaps), 1998.

Although no detailed plan for a lifeline SFOBB post-earthquake use is defined, it can be anticipated that the structure would be used to transport heavy equipment, such as cranes and bulldozers, to work sites. The structure would also be used to distribute supplies from the San Francisco and Oakland ports to recovery centers. Automobile and bus transit traffic would likely be banned from the SFOBB so as not to interfere with emergency response, then would be restored on the SFOBB as feasible. As a lifeline vehicular bridge, the SFOBB would have the flexibility to move equipment and goods during post-earthquake recovery that cannot be accommodated by Bay Area Rapid Transit (BART) and ferry service.

1.2.2 People, Freight, and Goods Movement - The existing SFOBB East Span cannot maintain high levels of freight and goods movement following an MCE.

The SFOBB East Span, currently operating at capacity, is used by approximately 272,000[6] vehicles each day, making it a critical transportation link in the Bay Area. The volume of traffic on the SFOBB is approximately double that of the Golden Gate Bridge and almost equal to the combined traffic carried by the four other Bay Area bridges. For motor vehicle traffic, the Golden Gate Bridge and other Bay Area bridges are essentially non-redundant systems, with alternative routes to the other bridges being time consuming to a level that seriously impacts commercial and institutional productivity. Providing a seismically safe, lifeline vehicular bridge crossing is critical to retaining the ability to move high volumes of people between San Francisco, the San Francisco Peninsula, and the East Bay.

The SFOBB is a primary route for movement of freight and goods between the San Francisco Peninsula and the East Bay. It provides access for San Francisco to the intrastate and interstate trucking network in the East Bay and beyond. The SFOBB provides a link for seaport cargo and air freight delivery between the ports and airports in both San Francisco and Oakland. The bridge is also a link for local delivery of freight and goods. The SFOBB carries the greatest amount of total traffic and truck traffic of all the Bay Area toll bridges (see Table 1.2-1). Maintaining the capacity of the East Span to accommodate large volumes of truck traffic is important for distribution of freight and goods to facilitate economic recovery following an MCE. Disruption of this critical link in the transportation system by damage or failure due to an earthquake would require rerouting approximately 8,000 truck trips per day to other toll bridges, assuming these other bridges are not similarly damaged. Extended interruption of the capacity of the East Span to accommodate large numbers of trucks would have an adverse effect on the local and regional economy.

[6] 1998 Traffic Volumes on the California State Highway System, State of California Business, Transportation and Housing Agency, Department of Transportation. Prepared in cooperation with the U.S. Department of Transportation Federal Highway Administration, April 2000.

Table 1.2-1 Annual Average Daily Total (AADT) Traffic and Truck Traffic on Bay Area Toll Bridges

Bridge	Total AADT	Truck AADT	Percent Trucks	Percent Large Trucks[a]
SFOBB	272,000	8,430	3.1	39
Dumbarton	65,000	2,470	3.8	34
San Mateo-Hayward	85,000	5,525	6.5	42
Golden Gate	116,000	2,286	2.0	16
Richmond-San Rafael[b]	60,000	4,180	7.0	43
Carquinez	109,000	7,740	7.1	64
Benicia-Martinez	98,000	7,546	7.7	50

Source: 1998 Traffic Volumes on the California State Highway System, Caltrans, April 2000.
[a]Percentage of 4- and 5-axle trucks of total trucks.
[b]Measurement location at junction of I-580/Route 101, Marin County.

1.2.3 Current Roadway Design Standards - The existing SFOBB East Span does not meet current roadway design standards for operations and safety.

Design standards are applied to bridge and roadway projects to provide a safe facility. The SFOBB East Span, constructed in the 1930s, does not meet all of the current mandatory and advisory design standards, including:

- Typical Section - The existing East Span has non-standard lane widths. Existing lanes are 3.5 meters (11.7 feet) wide compared to the 3.6-meter (12-foot) standard. The current standard is for a lane width that can accommodate large trucks and separate vehicles traveling at higher speeds. This is a higher standard than what was in place when the bridge was constructed;

- Roadway Shoulders - The existing East Span does not have roadway shoulders. Standard shoulder widths are 3 meters (10 feet) on either side of the roadway. Provision of shoulders on the SFOBB East Span would provide space for stalled vehicles to be moved out of travel lanes. Lack of shoulders contributes to the high level of congestion caused by even minor incidents on the existing East Span;

- Horizontal Alignment - The existing East Span lower deck approaching the east shore has a non-standard straight roadway length between two curves: 18.3 meters (60 feet) compared to the current 177-meter (581-foot) standard. Provision of a straight section of roadway between curves allows drivers to anticipate upcoming changes in roadway alignment and maintain vehicle control;

- Vertical Alignment - Where the existing East Span upper deck roadway meets the existing YBI tunnel entrance, the bridge connection has a vertical alignment that should not occur on a typical roadway. This vertical alignment reduces the amount of roadway a driver can see entering or leaving the tunnel and reduces the amount of time a driver has to respond to conditions in front of the vehicle. The existing

vertical curve approaching the YBI tunnel is 46 meters (150 feet). The current standard is 160 meters (525 feet);

- Superelevation - Curving roadways are designed to bank (elevation of one side of the roadway is higher) to promote safe turning of vehicles and provide driver comfort against outward centrifugal force. The existing East Span curve east of the tunnel portal has a non-standard superelevation rate of five percent compared to the standard eight percent;

- Clearances - The minimum vertical clearance on the existing East Span east of the tunnel is 4.9 meters (16 feet) compared to the 5.1-meter (17-foot) standard. Height standards above roadways have increased to accommodate larger vehicles and the need to transport specialized cargo on interstate highways. Horizontally, there is no space between the travel lanes and the bridge rail on the East Span. Standard minimum horizontal clearance is 1.2 meters (4 feet); and

- Stopping Sight Distance - The existing East Span has inadequate stopping sight distance around the curve on the existing bridge 520 meters (1,706 feet) east of the tunnel portal. According to current standards, the stopping sight distance for the inside lane would accommodate only a speed of 40 kilometers per hour (25 miles per hour).

1.3 BACKGROUND

1.3.1 The San Francisco-Oakland Bay Bridge

The SFOBB is historically important in the Bay Area and worldwide. Construction of this structure began in 1933 and was completed and opened to traffic in 1936. At the time of its construction, the bridge was the world's longest vehicular bridge, and the YBI tunnel, a double-decked structure, was the largest bore tunnel of its time at 23 meters (76 feet) long by 15 meters (50 feet) wide by 15 meters (50 feet) high (see Figure 1-1 in Appendix A).

The SFOBB currently serves 272,000 vehicles each day. The SFOBB provides regional access between the San Francisco Peninsula and the East Bay. As a component of Interstate 80 (I-80), it is a critical link in the interstate highway network. The Dwight D. Eisenhower System of Interstate and Defense Highways, established in 1954 during Eisenhower's presidency, is a network of access-controlled and grade-separated highways designed to serve the national defense and to connect states and routes of continental importance in Canada and Mexico.[7]

The SFOBB is a double-deck structure carrying five traffic lanes on each level. The West Span connects San Francisco to YBI. A concrete viaduct and approach ramps eastward from Fifth Street in San Francisco at the west end, 1,130 meters (3,707 feet) long, connect to the two suspension spans, each over 1,400 meters (4,593 feet) long.

[7] Federal-Aid Highway Act of 1954.

On the island, there are two concrete viaducts, 165 meters (541 feet) and 65 meters (213 feet) in length, at either end of the 164.4-meter (539-foot) long double-deck tunnel.

The East Span is the portion of the structure between YBI and Oakland. An 800-meter (2,625-foot) long viaduct extends from the YBI tunnel east portal eastward across the island. A series of steel truss spans carries the highway across the eastern portion of the Bay. The steel spans include a 737-meter (2,418-foot) cantilever truss adjacent to the island, followed by five high truss spans 155.1 meters (509 feet) each, and 14 shorter spans, which bring the roadways to the East Bay shoreline.

1.3.2 Overview of the Seismic Retrofit Program

Caltrans' design program to seismically retrofit State-owned, city, and county bridges has been highly influenced by recent earthquakes in California. In particular, the 1971 San Fernando earthquake, the 1987 Whittier Narrows earthquake, the 1989 Loma Prieta earthquake, and the 1994 Northridge earthquake greatly influenced the direction, design, scientific research, and priorities of Caltrans' seismic retrofit program. These earthquakes prompted new research and funding for the seismic retrofit of transportation structures, which has included pioneering research and design focusing on the seismic behavior of large bridges. This has led to increased understanding of how bridges behave in earthquakes, new techniques for retrofitting existing bridges, and improved design criteria for new construction. Over the past three decades, this work has placed Caltrans at the forefront of the evolving field of seismic retrofit design. For further information on how the program relates to the East Span Project, refer to Appendix K.

1.3.3 Effects of the Loma Prieta Earthquake and a Maximum Credible Earthquake

On October 17, 1989, the Loma Prieta earthquake struck the San Francisco Bay Area. Its epicenter was in a sparsely populated area of the Santa Cruz Mountains, 97 kilometers (60 miles) away from the SFOBB. The California Office of Emergency Services (OES) reports that the earthquake caused 62 deaths and $5.6 billion in property damage, and 8,000 people were left homeless. Over 1,300 buildings were destroyed and 20,000 buildings were damaged.[8] On the SFOBB, the earthquake caused a portion of the upper deck of the East Span to collapse onto the lower deck, resulting in one death. The East Span was closed for four weeks while the damage was repaired. Caltrans estimated that the increased delay experienced by commuters rerouted to other Bay crossings, including other modes such as ferries or BART, cost as much as $12 million.

The Association of Bay Area Governments (ABAG) conducted an assessment of the regional macroeconomic impacts of the Loma Prieta earthquake. ABAG concluded that the maximum loss to the Gross Regional Product was in the range of $181 to $725 million. ABAG noted that San Francisco suffered a significant loss ($73 million) in

[8] California Office of Emergency Services, Loma Prieta Earthquake: Homes/Businesses Damaged/ Destroyed, December, 1989.

taxable sales activity, and that "a major portion of the loss in economic activity in San Francisco may have been due to a loss in transportation access."[9]

The Loma Prieta earthquake showed the vulnerability of the transportation system to a relatively distant earthquake. Future planning must recognize the likelihood and potential consequences of closer and more powerful events on the San Andreas and Hayward faults. An MCE on the San Andreas fault could generate over 30 times more energy than the Loma Prieta earthquake. An MCE on the Hayward fault could generate about the same energy as the Loma Prieta earthquake. Damage from an MCE on either of these faults could be heavier and much more widespread compared to damage from the Loma Prieta earthquake, including the collapse of thousands of buildings, extensive infrastructure damage, and major loss of life. The magnitude of such a natural disaster would necessitate the kind of emergency access provided by the bridge retrofitted to lifeline standards. On the existing SFOBB East Span, an MCE could cause catastrophic bridge failure, potentially resulting in numerous immediate casualties and requiring many months to reopen the bridge or years to build a replacement. Immediate emergency response and more long-term economic recovery would be delayed.

1.3.4 Analysis of Potential Retrofit of SFOBB East Span

Caltrans began action following the Loma Prieta earthquake to design seismic safety improvements for the SFOBB East Span. Seismic safety strategies initially investigated focused on retrofit of the existing East Span structure. A retrofit alternative was devised and initial environmental review conducted. Consultation with permitting and regulatory agencies was initiated.

An important consideration for the retrofit of bridges maintained by Caltrans is the cost of upgrading the existing structures to current seismic criteria measured against the remaining useful life of the bridges. Caltrans has developed a cost/benefit formula to assist in determining the need to retrofit a bridge compared to replacing it. First it must be determined that there is a viable retrofit alternative (i.e., the existing structure can be retrofitted to meet seismic safety criteria established for the structure). This decision is made by Caltrans with input from a Seismic Advisory Board, an industry and academic advisory panel which was established following the Loma Prieta earthquake to provide Caltrans assistance in determining effective seismic safety technologies.

The Caltrans formula takes into account both construction costs and life-cycle costs.[10] Cost comparisons of retrofit and replacement alternatives indicated that seismic retrofit of the existing span could be accomplished at a lower cost than the cost to replace the structure. However, replacement bridge alternatives would have lower life-cycle

[9] "Macroeconomic Effects of the Loma Prieta Earthquake," ABAG, 1991.
[10] California Department of Transportation, Transportation Economics Planning Program, Retrofit vs. New Bridge, An Economic Analysis for the East Span of the San Francisco-Oakland Bay Bridge, April 1997.

costs[11]; therefore, consideration of bridge replacement was recommended to Governor Pete Wilson by the Business, Transportation and Housing Agency.

1.3.5 Analysis of Potential Replacement of the SFOBB East Span

In February 1997, Governor Pete Wilson adopted the recommendations of the Business, Transportation and Housing Agency that replacement of the SFOBB East Span be considered. The Metropolitan Transportation Commission (MTC) organized the San Francisco-Oakland Bay Bridge Design Task Force (Task Force) to consider replacement bridge alternatives. Alternatives under consideration in this environmental document include replacement options defined through the Task Force proceedings. The Task Force mandate was to develop a consensus recommendation on a design option for a new eastern span of the SFOBB and to recommend any additional features that might be included in the design of the bridge that would not be borne by funding allocated from the State of California. A description of the MTC process is provided in the Preface and Appendix E — Consultation and Coordination of this Final EIS.

1.3.6 Other SFOBB Seismic Safety Projects

Caltrans is undertaking a number of independent actions to address the overall need of providing a lifeline bridge connection between the cities of San Francisco and Oakland. Design of one project does not determine or preclude design of the other projects. In combination, these actions will provide for a lifeline structure connecting San Francisco and the San Francisco Peninsula to the East Bay. The individual projects, in addition to contributing to the seismic safety improvement of the SFOBB, have been defined to contribute independently to seismic safety of bridge users in the event of an MCE and the associated economic benefits of keeping the bridge usable after an MCE. As each of the projects is completed, bridge users will benefit from seismic safety improvements and specific lifeline access issues will be resolved.

In addition to the East Span Project, Caltrans is undertaking other actions to seismically retrofit the SFOBB. The limits of these projects are shown in Figure 1-1 in Appendix A and consist of:

- West Approach Seismic Replacement - The West Approach extends from Fifth Street to the West Anchorage in San Francisco. The retrofit of this portion of the bridge calls for complete replacement of most of the structure. Completion of the West Approach Seismic Replacement Project will provide for lifeline access into San Francisco and the Transbay Transit Terminal area in the event of an MCE;

- West Span Seismic Retrofit - The West Span is the portion of the structure from the West Anchorage to YBI. Retrofit of the West Span will add bracing beneath the upper deck, add plates on the towers, and replace the existing lattice work members on the truss portions with solid or perforated plates. Strengthening the

[11] Memorandum to then-Governor Pete Wilson from Dean R. Dunphy, then-Secretary, Business, Transportation and Housing Agency, January 10, 1997, re "Consideration of Replacement of the Eastern Spans of the San Francisco-Oakland Bay Bridge to Provide Seismic Safety."

columns has been partially completed. Upon completion of the West Span Seismic Retrofit Project, lifeline access will be provided between San Francisco and YBI and ensure that bridge damage during an MCE will not affect navigation in the ship channel underneath the structure. In addition, the bridge will be open to emergency vehicles immediately following the event provided access roadways are in operation;

- West Viaduct, YBI - The West Viaduct is the portion of the bridge on YBI immediately west of the YBI tunnel. Retrofit of the West Viaduct was completed in January 2000. The project strengthened the existing double-deck structure by retrofitting or replacing columns and footings and replacing the bent caps underneath the upper deck on-ramp;

- Yerba Buena Island Tunnel - The seismic retrofit project for the tunnel is currently under way. Rock bolts will tie back the portals, arched headwalls, selected retaining walls, architectural walls, and one rock slope north of the west portal. Seismic safety improvements to the tunnel will ensure that the high traffic volumes using SFOBB can be maintained in an MCE and that detours on the island will not be required to move through-traffic; and

- East Span Interim Seismic Retrofit – In summer 2000, work was completed to implement an interim seismic retrofit of the existing East Span to withstand a likely earthquake (estimated to be an earthquake that induces less than 0.25g on the existing structure), but not an MCE. The Interim Retrofit Project consisted of strengthening bents and columns on the East Viaduct (on YBI) and strengthening columns, bents, and trusses at selected locations on the East Span structure. The interim project provides for increased seismic safety on the existing structure until an East Span retrofit/replacement alternative is implemented.

1.3.7 Legislative Framework

The California Legislature has in various legislative findings and declarations expressed its intent to complete the seismic retrofit of State-owned and State-operated highways. Following the 1971 San Fernando Valley earthquake, seismic design standards for transportation facilities were reassessed in light of the unanticipated damage to certain roadway structures, and a retrofit program was begun. The extensive roadway damage caused by the 1989 Loma Prieta earthquake in northern California and the 1994 Northridge earthquake in southern California prompted an acceleration of the retrofit program, including several efforts to increase program funding. In 1991, the legislature authorized financing seismic retrofit projects from motor vehicle fuel tax revenues and additional funding mechanisms, declaring that "it is in the best interests of the people of California to immediately finance retrofit projects to make state highways safe during seismic events, and to offset any possible delays caused by these projects on approved state highway projects contained in the state transportation improvement program for 1990..." (Government Code, Chapter 5, Article 1, Amended: Statutes of 1991, Chapter 195).

In 1995, recognizing the increasing financial drain of the ongoing seismic retrofit program on limited funding resources, the legislature placed the Seismic Retrofit Bond Act of 1996, or Proposition 192, on the March 1996 ballot, declaring that "the completion of seismic safety retrofit work is essential to the welfare and economy of the state" (Government Code, Title 2, Division 1, Chapter 12.48, Article 1). This act, approved by the voters in 1996, authorized the sale of over $2 billion in state revenue bonds for financing retrofit improvements and temporarily suspended state statutes that were deemed to potentially delay or unnecessarily encumber their implementation. The seismic retrofit and rehabilitation of the SFOBB East Span is a priority project under the state's accelerated retrofit program.

Senate Bills 60 and 226 were passed by the State Legislature and signed into law by the Governor on August 20, 1997. Together, these bills provide a financing mechanism and identify funding sources for seismic improvements for Bay Area toll bridges, including the SFOBB East Span. Senate Bill 60 establishes a one dollar toll surcharge on the seven Bay Area State-owned bridges and identifies additional funds available for seismic upgrades. State fuel tax revenues earmarked for seismic upgrade projects will fund approximately 33.4 percent of the project costs. State Seismic Retrofit Revenue Bonds issued by the State after voter approval of Proposition 192 in March 1996 will fund an additional 30.2 percent. The one dollar toll surcharge on Bay Area toll bridges for eight years will fund the remaining 36.5 percent.

Senate Bill 226 transferred programming authority for Bay Area toll bridges from the California Transportation Commission to the Metropolitan Transportation Commission. As a result, the Bay Area Toll Authority (BATA) is permitted to extend the period of toll surcharges to cover the cost of amenities. These include a cable-supported or other bridge design, improvements to the Transbay Transit Terminal (including possible relocation and/or ramp reconfiguration), and the addition of bicycle/pedestrian access on the SFOBB. Assembly Bill 2038, which amended Senate Bill 60 in June 1998, allows BATA to fund the addition of bicycle/pedestrian access to either the new East Span or the retrofitted West Span or both, within the restrictions set forth by Senate Bill 60 or a future toll surcharge extension.

Seismic retrofit projects, including the East Span Project, are exempt from the requirements of the California Environmental Quality Act (CEQA) under California Streets and Highways Code Section 180.2 and CEQA Section 21080 (see Chapter 5). Although CEQA review has not been conducted for the project, detailed environmental and socioeconomic review is being undertaken to comply with the National Environmental Policy Act (NEPA) and other applicable state and federal laws. The East Span Project will also be subject to the permitting requirements of federal and state regulatory agencies. Consultation is under way with public agencies, including U.S. Coast Guard, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Advisory Council on Historic Preservation, National Marine Fisheries Service, San Francisco Bay Conservation and Development Commission, California Department of Fish and Game, State Historic Preservation Officer, State Lands Commission, and San Francisco Bay Regional Water Quality Control Board.

1.3.8 Concurrence in the Purpose and Need Statement

The project Purpose and Need Statement presented in this chapter was drafted following FHWA Technical Advisory T 6640.8, "Guidance Material for the Preparation of Environmental Documents." The advisory explains that the goals of the Purpose and Need Statement is to "Identify and describe the transportation problem(s) which the proposed action is designed to address." The format and topics described in the advisory were followed in the development of this Purpose and Need chapter.

Determination of the Purpose and Need was more fully developed with public input received at MTC Bay Bridge Design Task Force and Engineering Design Advisory Panel meetings on April 16, 22, 23, and May 8, 1997, which served as project scoping meetings.

The Purpose and Need Statement presented in this Chapter was refined through a collaborative process among federal agencies as outlined in the NEPA/404 Integration Memorandum of Understanding (MOU) (see Appendix F). The MOU sets out a consultation process among designated federal agencies resulting in written concurrence in the project Purpose and Need Statement. Signatories to the East Span Seismic Safety Project Purpose and Need Statement are FHWA, U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, National Marine Fisheries Service, U.S. Environmental Protection Agency, and the Federal Transit Administration.

Non-signatory agencies participating in the development of the Purpose and Need Statement were the San Francisco Bay Regional Water Quality Control Board, the San Francisco Bay Conservation and Development Commission, U.S. Coast Guard, and the California Department of Fish and Game.

A summary of the consultation process resulting in obtaining concurrence in the Purpose and Need Statement is presented in Appendix F.

CHAPTER 2
PROJECT ALTERNATIVES

This chapter describes the alternatives that were analyzed in the Draft Environmental Impact Statement (DEIS), project alternatives that were initially considered but withdrawn from consideration prior to preparation of the DEIS, the reasons for their withdrawal, and identification of the Preferred Alternative.

The Metropolitan Transportation Commission (MTC) is the transportation planning, coordinating, and financing agency for the nine-county San Francisco Bay Area. It functions both as the region's transportation planning agency (RTPA) and as the region's metropolitan planning organization (MPO)—state and federal designations, respectively. The Regional Transportation Plan (RTP), which MTC prepares, is a comprehensive guide for the development of mass transit, highway, airport, seaport, railroad, bicycle, and pedestrian facilities within the Bay Area. The MTC also allocates state and federal funds for transportation projects based on compatibility with this plan.

The MTC-recommended alternative included in this FEIS is Replacement Alternative N-6, self-anchored suspension design variation with a bicycle/pedestrian path. The California Department of Transportation (Caltrans) and Federal Highway Administration (FHWA) identified Replacement Alternative N-6 as the Preferred Alternative. The Preferred Alternative has been identified as the Least Environmentally Damaging Practicable Alternative (LEDPA) in consultation with the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (ACOE). See Section 2.2.6 – Preferred and Least Environmentally Damaging Practicable Alternative for more details.

Pursuant to the National Environmental Policy Act (NEPA), the EIS identifies environmental impacts and values of all reasonable alternatives in sufficient detail to enable decision-makers to evaluate their comparative merits. The East Span Project is a seismic safety project and does not change bridge capacity. As such, a Major Investment Study (MIS) for the SFOBB corridor was not prepared. Identification of the Preferred Alternative occurred following circulation of the DEIS for a 60-day public review period and consideration of all public comments received. Responses to all substantive comments have been prepared and can be found in Volume II, Section I – DEIS Comments and Responses.

The No-Build Alternative does not satisfy the project purpose and need. It is presented and evaluated as a basis of comparison with the reasonable alternatives. As noted in Chapter 1, Caltrans added selected minimal seismic strengthening and stiffening elements to the existing East Span structure as an interim measure. That project, completed in summer 2000, received environmental approval pursuant to NEPA and is not evaluated as an alternative in this Final EIS. The No-Build Alternative assumes completion of this interim work.

2.1 INTRODUCTION

2.1.1 Development of Alternatives

Caltrans has performed preliminary engineering and impact analysis on a range of possible project alternatives in the EIS. The retrofit and replacement alternatives, along with the No-Build Alternative, are described in Section 2.2. Replacement bridge design variations considered in the DEIS are described in Section 2.3, including design variations incorporated into the Preferred Alternative. Section 2.4 provides a comparison of the alternatives, including costs, constructibility, and potential to meet the purpose and need. Section 2.5 discusses multi-modal options for alternatives, and Section 2.6 describes construction scenarios for each of the build alternatives. Section 2.7 describes the alternatives, design variations, and detour options that were considered and subsequently withdrawn from further consideration and the reasons for their withdrawal.

The range of alternatives considered in the EIS was established by Caltrans and FHWA in accordance with NEPA requirements and in consultation with permitting and regulatory agencies under guidance of the NEPA/404 Integration Memorandum of Understanding (NEPA/404 MOU). The NEPA/404 integration process is implemented when a project has the potential to affect waters of the U.S. under the jurisdictional authority of the U.S. Army Corps of Engineers (ACOE), and it is anticipated that an individual Section 404 permit will be required. Participants considered options and provided written concurrence on the range of alternatives and the criteria established for selection of alternatives. The following criteria were agreed upon by the NEPA/404 signatories:

- Meets Caltrans criteria for designation as a lifeline route;
- Meets current standards for operations and safety to the greatest extent possible;
- Maintains the existing number of traffic lanes during peak hours and after construction;
- Does not preclude a bicycle/pedestrian path;
- Does not preclude future improvements to YBI access ramps;
- Minimizes impacts to environmental resources;
- Provides a high level of visual quality; and
- Is a cost-effective solution.

Consistent with the NEPA/404 MOU, NEPA/404 integration process signatories (ACOE and EPA) also concurred on the identification of the Least Environmentally Damaging Practicable Alternative (LEDPA). (See Appendix F for the concurrence letters from the NEPA/404 signatories.)

2.1.2 Project Limits/Location

The SFOBB crosses San Francisco Bay in an east-west direction in the central portion of the San Francisco Bay Area and provides a travel route between San Francisco and Alameda counties (see Figure 2-1 in Appendix A). The bridge touches down near Pier 26 in San Francisco and in northwest Oakland between the East Bay Municipal Utility

District (EBMUD) wastewater treatment facility and the Emeryville Crescent. The West and East Spans of the bridge are connected on YBI by viaduct sections on either side of the YBI tunnel. A main navigation opening channel is located between Columns E2 and E3 of the SFOBB East Span. The channel, shown on Figure 2-2 (Appendix A), is 405 meters (1,328 feet) wide, with vertical clearance of 60 meters (197 feet) above Mean Sea Level (MSL).

The East Span Project will retrofit and/or replace the portion of the SFOBB between the eastern portal of the YBI tunnel and the SFOBB Toll Plaza in Oakland. The western project limit is the eastern portal of the YBI tunnel; however, project-related traffic controls may extend to the western portal of the YBI tunnel and project signage may extend to the west approach in San Francisco. The eastern project limit is located approximately 400 meters (1,312 feet) west of the toll plaza on a spit of land referred to as the Oakland Touchdown area. The project area limits are shown on Figure 2-2 (Appendix A). The project area is defined as the area within the project limits in which temporary and permanent structures would be placed by any of the alternatives and defines the area within which construction activities, including temporary detours, would be expected to occur. The project area widens over water to allow for marine construction activities. In addition, Bay waters on the north side of YBI are included within the project area to allow staging for the delivery of bulk materials and construction equipment by barge or vessel to staging areas on YBI.

2.2 ALTERNATIVES CONSIDERED

Five alternatives, No-Build, Retrofit Existing Structure, Replacement Alternatives N-2, N-6, and S-4, were considered for the East Span Project. Replacement Alternatives N-2 and N-6 are aligned to the north of the existing bridge and Replacement Alternative S-4 aligns south of the existing bridge (see Figure 2-3 in Appendix A). Alignment drawings for the build alternatives are presented in Appendix A (see Figure Series 2-4, 2-7, 2-10, and 2-11). In order to reroute traffic around the construction area while portions of the existing East Span are dismantled and a new transition structure is completed where the existing bridge now stands on YBI, temporary detours would be required on YBI for the three replacement alternatives (N-2, N-6, and S-4).

Caltrans completed a separate Pile Installation Demonstration Project (PIDP) in December 2000 to provide empirical data to contractors and resource agencies about pile driving in the Central Bay. Three test piles were installed as part of the PIDP. The three installed piles would not be used as structural components of any build alternative, though they would be left in place during construction of the East Span Project and could be used for barge mooring. Prior to completion of the East Span Project, all build alternatives would include removal of these three test piles to an elevation of at least 0.46 meter (1.5 feet) below the mudline, to be measured at the time of removal.

In order to connect the new bridge with the existing retrofitted viaduct on YBI and the SFOBB Toll Plaza at the Oakland Touchdown area, all three replacement alternatives would require dismantling the existing East Span structure. Dismantling would also be

required by USCG regulations. A description of the dismantling process is provided in Section 2.6.3.

2.2.1 No-Build Alternative

The No-Build Alternative would retain the existing SFOBB East Span and only assumes the seismic improvements that were completed under the Interim Retrofit Project. The Interim Retrofit Project strengthened bents and columns on the viaduct section on YBI and strengthened or stiffened columns, bents, and trusses at selected locations on the structure, so that the existing East Span would be able to withstand a smaller and more probable earthquake. This work was completed during summer 2000. The No-Build Alternative is evaluated primarily as a basis for comparison with the build alternatives.

2.2.2 Replacement Alternative N-6 (Preferred Alternative)

Replacement Alternative N-6 would construct a 3,514-meter long (11,526-foot long) new bridge north of the existing East Span and dismantle the existing structure. (See Figures 2-10.1a through 2-10.5b in Appendix A).

The western limit of construction for Replacement Alternative N-6 is the eastern portal of the YBI tunnel; however, the limits of work may extend to the western approach of the West Span in San Francisco due to project-related traffic controls and signage. Part of the existing YBI East Viaduct would be retrofitted, modified, partially demolished, and reconstructed. At Bent 48 (see Figures 2-10.1a through 2-10.1c in Appendix A), the new bridge begins with transition structures separating the double-decked lanes into two parallel structures. Outrigger supports would be used to support the upper deck as the lower deck transitions to a structure parallel with the upper deck. The parallel structures curve, enter a tangent or straight section over the existing main navigation opening, curve, then align on tangent toward the Oakland Touchdown area. The parallel structures reach the Oakland shore along the northern edge of the existing Oakland Touchdown area and conform to the existing traffic lanes west of the SFOBB Toll Plaza.

Replacement Alternative N-6 consists of two parallel structures supported by 25 piers over water and 19 bents, set on YBI, and the Oakland Touchdown area. The structures would each be 25.07 meters (82 feet) wide and typically separated by 15 meters (50 feet). The typical roadway section for each bridge deck consists of five lanes, each 3.6 meters (12 feet) wide, left and right shoulders, each 3 meters (10 feet) wide, and traffic barriers (see Figure 2-8 in Appendix A). A 4.7-meter (15.5-foot) bicycle/pedestrian path would be located on the south side of the eastbound deck, 0.3 meter (1 foot) above the roadway elevation and includes viewing areas or belvederes. The five belvederes on the skyway would be 12 meters (39 feet) long by 1.2 meters (4 feet) deep. Caltrans is still investigating whether to include one or two belvederes on the main span that would be 20 meters (66 feet) long by 1.2 meters (4 feet) deep. A simulation of a belvedere design is shown on Figure 2-24 in Appendix A.

The height of the bridge, including the transition structure and the parallel structures, would vary in elevation from 50-55 meters (164-180 feet) above Mean Sea Level (MSL)

at the YBI East Viaduct to 5 meters (16 feet) above MSL at the Oakland Touchdown. A typical profile for replacement alternatives is presented in Figure 2-9 in Appendix A.

2.2.3 Replacement Alternative N-2

Replacement Alternative N-2 would construct a new 3,479-meter long (11,411-foot long) new bridge north of the existing East Span and dismantle the existing structure. (See Figures 2-7.1a through 2-7.5 in Appendix A). The alignment parallels the existing bridge and maintains minimal clearance between the old and new structures to accommodate construction of the new bridge and dismantling of the existing structure.

The western limit of construction for Replacement Alternative N-2 is the eastern portal of the YBI tunnel; however, the limits of work may extend to the western approach of the West Span in San Francisco due to project-related traffic controls and signage. The existing YBI East Viaduct would be retrofitted, modified, partially demolished, and reconstructed. At Bent 48 (sees Figure 2-7.1a and 2-7.1b in Appendix A), the new bridge would begin with new transition structures separating the double-decked lanes to two parallel structures. Outrigger supports would be used to support the upper deck as the new lower deck transitions to a structure parallel with the new upper deck. The parallel structures would curve, enter a tangent (or straight section) over the existing main navigation opening, curve, and align on tangent toward the Oakland Touchdown area. The parallel structures would reach the Oakland shore along the northern edge of the existing Oakland Touchdown area and conform to the existing traffic lanes to the west of the SFOBB Toll Plaza.

Replacement Alternative N-2 would consist of two parallel structures supported by 22 piers over water and 19 bents set on YBI and the Oakland Touchdown area. The structures would each be 25 meters (82 feet) wide and separated by 15 meters (50 feet). The typical roadway section for each bridge deck would consist of five lanes, each 3.6 meters (12 feet) wide, left and right shoulders, each 3 meters (10 feet) wide, and traffic barriers. A 4.7-meter (15.5-foot) bicycle/pedestrian path would be located on the south side of the eastbound deck, 0.3 meter (1 foot) above the roadway elevation and includes viewing areas or belvederes. The five belvederes on the skyway would be 12 meters (39 feet) long by 1.2 meters (4 feet) deep. Caltrans is still investigating whether to include one or two belvederes on the main span that would be 20 meters (66 feet) long by 1.2 meters (4 feet) deep. A simulation of a belvedere design is shown on Figure 2-24 in Appendix A.

The height of the bridge, including the transition structure and the parallel structures, would vary in elevation from 50 to 55 meters (164 to 180 feet) above MSL at the East Viaduct on YBI to 5 meters (16 feet) above MSL at the Oakland Touchdown. A typical profile for replacement alternatives is presented in Figure 2-9 in Appendix A.

2.2.4 Replacement Alternative S-4

Replacement Alternative S-4 would construct a 3,550-meter (11,644-foot) long bridge south of the existing East Span and dismantle the existing structure. (See Figures 2-11.1a through 2-11.5 in Appendix A.) Replacement Alternative S-4 was developed to

minimize bridge length, avoid use of flat land to the north of the existing East Span on YBI and avoid an in-Bay crossing with the EBMUD sewer outfall located to the south of the existing East Span (see Figure 2-3 in Appendix A).

The western limit of construction for Replacement Alternative S-4 is the eastern portal of the YBI tunnel; however, the limits of work may extend to the western approach of the West Span in San Francisco due to project-related traffic controls and signage. The existing YBI East Viaduct would be retrofitted, modified, partially demolished, and reconstructed. At Bent 48 (see Figures 2-11.1a and 2-11.1b in Appendix A), the new structure would begin with new transition structures separating the double-decked lanes to two parallel structures. Outrigger supports would be used to support the upper deck as the lower deck transitions to a structure parallel with the upper deck. The parallel structures would curve, enter a tangent or straight section over the existing main navigation opening, curve gradually, and align toward the Oakland Touchdown area. The parallel structures would reach the Oakland shore to the south of the existing East Span and transition to the existing roadway west of the SFOBB Toll Plaza.

Replacement Alternative S-4 would consist of two parallel structures supported by 23 piers over water and 19 bents set on YBI, and the Oakland Touchdown area. The structures would each be 25.07 meters (82 feet) wide and separated by 15 meters (50 feet). The typical section for each bridge deck would consist of five lanes, each 3.6 meters (12 feet) wide, left and right shoulders, each 3 meters (10 feet) wide and traffic barriers. A 4.7-meter (15.5-foot) bicycle/pedestrian path would be located on the south side of the eastbound deck, 0.3 meter (1 foot) above the roadway elevation and includes viewing areas or belvederes. The five belvederes on the skyway would be 12 meters (39 feet) long by 1.2 meters (4 feet) deep. Caltrans is still investigating whether to include one or two belvederes on the main span that would be 20 meters (66 feet) long by 1.2 meters (4 feet) deep. A simulation of a belvedere design is shown on Figure 2-24 in Appendix A.

The height of the bridge, including the transition structure and the parallel structures, would vary in elevation from 50-55 meters (164-180 feet) above MSL at the East Viaduct to 5 meters (16 feet) above MSL at the Oakland Touchdown. A typical profile for the replacement alternatives is presented in Figure 2-9 in Appendix A.

2.2.5 Retrofit Existing Structure Alternative

Interim seismic retrofit work on the existing East Span was completed at the Oakland Touchdown area in 1998 and in the summer of 2000 on the truss spans and cantilever main span sections, but these are not components of the Retrofit Existing Structure Alternative. This alternative would retrofit the existing SFOBB East Span to withstand a maximum credible earthquake (MCE) on the San Andreas or Hayward faults. The seismic retrofit strategy of this alternative is based on isolating the superstructure from the substructure (towers and foundations). This work would include constructing additional large diameter piles and new pile caps around the existing foundations, strengthening and stiffening the towers, installing isolation bearings at the top of the towers, and strengthening and/or stiffening the superstructure truss members. Two

new large deepwater columns would be added to the cantilever span in the main navigation opening.

However, constrained by a 1930s level of material and construction technology and the complexity of the structure, it is impossible to retrofit the existing East Span to lifeline standards with any reasonable degree of confidence. The seismic capacity of many of the existing materials, the interaction of major structural elements during a seismic event, and the condition of existing foundations are all uncertain. Although substantial modifications to the East Span are proposed as a part of the Retrofit Existing Structure Alternative, it is nevertheless anticipated that substantial damage would occur as a result of an MCE and require extensive reconstruction or replacement. Potential modes of failure are the superstructure unseating from the towers, a failure of column support due to a lack of sufficient reinforcement, the concrete foundations snapping from the tops of the timber piles, structure members bending in the cantilever section, and mangled deck joints that could impede traffic. Replacement would be necessary if structural safety criteria could not be met through repairs to the damaged bridge.

If damage is such that repair of the cantilever section is feasible, this may require complete closure of the East Span from six months to one year. If, however, damage is sufficiently severe that replacement becomes necessary, the East Span would be completely closed for a substantially longer period of time.

The Retrofit Existing Structure Alternative would retrofit both the existing East Span and the East Viaduct section on YBI. The alignment of the bridge would remain unchanged and the bridge would remain a double-deck structure. (See Figures 2-4.1 through 2-4.4 in Appendix A.) Each deck roadway cross section would also remain the same, five 3.5-meter (11.5-foot) wide lanes with no roadway shoulders.

Portion of East Span in Bay

The seismic retrofit strategy for the Retrofit Existing Structure Alternative is based on strengthening and stiffening the substructure (below deck towers and foundations) and isolating the superstructure. Large-diameter piles would be added around the perimeter or on both sides of all existing foundations. New, larger pile caps would be constructed to join the expanded foundations with the existing foundations. Figures 2-5 and 2-6 (Appendix A) show the "before" condition and the "after" simulation of the retrofitted bridge.

The tower legs in the main navigation opening would be encased in concrete. Isolation bearings would be installed on the tops of towers to isolate the superstructure from the substructure and allow differential horizontal movements of approximately 1.2 meters (4 feet) between the two to minimize force transfer during earthquake events.

Two new columns (E2A and E2B) would be added to the cantilever main span just east of YBI (see Figures 2-4.1 and 2-4.2 in Appendix A for locations of new columns).

The seismic retrofit strategy would also add a new edge truss to restrict deformations in the cantilever section. An edge truss is a spanning horizontal truss beam that is extended from the bottom of the lower deck to the bottom of the upper deck (see

Figure 2-6 in Appendix A). Retrofitting truss members would include wind bracing and strengthening floor grid and vertical members.

Portion of East Span on Yerba Buena Island

The Retrofit Existing Structure Alternative would strengthen the East Viaduct and columns. The substructure of the East Viaduct would be retrofitted by enlarging and encasing selected columns and footings in concrete, adding cast-in-drilled-hole piles/tie-downs under the footings, enlarging the footings and the pile caps, and installing isolation bearings at the top of columns, and strengthening the deck by replacing expansion joints. Columns YB2, YB3, and YB4 would be encased in concrete and the foundations would be expanded.

2.2.6 Preferred and Least Environmentally Damaging Practicable Alternative (LEDPA)

In December 1998, after a thorough evaluation of project alternatives and consideration of comments from the public and agencies on the DEIS, Caltrans identified Replacement Alternative N-6, self-anchored suspension design variation, including a bicycle/pedestrian path, as its Preferred Alternative. In October 2000, FHWA also identified Replacement Alternative N-6 as the Preferred Alternative.

The Preferred Alternative has been identified as the Least Environmentally Damaging Practicable Alternative (LEDPA) by ACOE (on February 12, 2001) and EPA (on March 15, 2001). Documentation letters can be found in Appendix F. Identification of Replacement Alternative N-6 as the Preferred Alternative and the LEDPA in this FEIS has been coordinated through the NEPA/404 Integration MOU. The LEDPA is identified under the Federal Clean Water Act Section 404 (b)(1) alternatives evaluation process. The Section 404 (b)(1) process requires the ACOE, with input from the EPA, to make a determination of the LEDPA for any action involving discharge of dredge or fill material into waters of the U.S.

As a result of the alternatives analysis process undertaken for the East Span Project, it was determined that Replacement Alternative S-4 would have fewer permanent impacts to special aquatic sites protected by Section 404. Based on the 1999 eelgrass survey, Replacement Alternatives N-2 and N-6 would permanently affect 1.36 hectares (3.36 acres) of sand flats and 0.22 hectare (0.55 acre) of eelgrass, whereas Replacement Alternative S-4 would permanently affect 0.01 hectare (0.02 acre) of sand flats, 0.05 hectare (0.12 acre) of wetland and 0.15 hectare (0.37 acre) of eelgrass.

The "Guidelines for Specification of Disposal Sites for Dredged or Fill Material" (40 CFR 230) state that a Section 404 permit shall not be issued for discharge of dredged or fill materials into waters of the U.S. if there is a practicable alternative which would have less adverse impacts on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences (40 CFR 230.10(a). An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall purpose (40 CFR 230.10(a)(2)). Although Replacement Alternative S-4 would have fewer impacts on eelgrass and sand flats, it would pose several logistical problems that render it not

practicable. Replacement Alternative S-4 would take land from an operating USCG facility, thereby constraining the mission of that facility; it uses land from a Section 4(f) resource (Gateway Park) for which there are prudent and feasible alternatives that avoid that use; it compromises the operation of an important sewer outfall that serves over 610,000 people along the east side of the Bay; it results in more complex construction to protect that outfall; and it results in more extensive and more difficult in-Bay construction because of considerably greater depth to bedrock to construct the main span tower. As a result of these logistical impediments, Replacement Alternative S-4 does not meet the standards for practicability as defined in the Section 404 guidelines.

Replacement Alternatives N-2 and N-6 meet the Section 404 standards of practicability. The following are the key logistical benefits of these alternatives:

- Replacement Alternatives N-2 and N-6 avoid conflicts with the USCG base that is responsible for search and rescue operations, marine safety, vessel traffic management, and aid to navigation and communication in the Bay. The base operates 24 hours a day, 7 days a week. The USCG coordinates over 2,000 local emergency response requests each year. In 1999 alone, its YBI facility saved 180 lives and over $34 million in property. Its Vessel Traffic Service is essential for the safe passage of large ocean-going ships (such as those moving daily to and from the Ports of Oakland and San Francisco) and is important in protecting the Bay environment by averting maritime accidents. In a letter to Caltrans dated October 18, 2000, the USCG stated that a southern alignment for the East Span Project (such as Replacement Alternative S-4) would severely restrict USCG's flexibility to utilize that part of its already limited footprint. It further stated that a southern alignment would constrain USCG's ability to effectively conduct emergency service operations from YBI.

- Replacement Alternatives N-2 and N-6 avoid land on the Oakland Touchdown designated by the Oakland Base Reuse Authority (OBRA) for a proposed park. The proposed park was determined by FHWA to be protected by the provisions of Section 4(f) of the Department of Transportation Act. Under Section 4(f), the Secretary of Transportation may approve a transportation project requiring the use of publicly owned land of a public park only if there is no prudent and feasible alternative to using that land, and the project includes all possible planning to minimize harm to the park. FHWA's implementing regulations (771.135(a)(2)) state that alternatives that avoid Section 4(f) properties are not prudent and feasible if they have unique problems or unusual factors, or if the cost, social, economic, and environmental impacts, or community disruption resulting from such alternatives reach extraordinary magnitudes. Replacement Alternatives N-2 and N-6 were not found to involve unique problems, unusual factors, or environmental impacts that reach extraordinary magnitudes; they are both prudent and feasible alternatives that avoid the use of the public park by Replacement Alternative S-4. In addition, because all build alternatives result in Section 4(f) uses (please see Section 6.3 — Description of Section 4(f) Resources Used by Project Alternatives), Caltrans and FHWA evaluated the Section 4(f) uses to establish which alternative results in the least net harm to Section 4(f) resources. Replacement Alternatives N-2 and N-6

were determined to be the feasible and prudent alternatives with the least net harm to Section 4(f) resources. For a detailed evaluation of Section 4(f) resources, see Chapter 6 — Section 4(f) Evaluation of this FEIS.

- The alignments of Replacement Alternatives N-2 and N-6 provide easier access to bedrock to construct the main span tower than Replacement Alternative S-4. With Replacement Alternative N-2, depth to bedrock would be approximately 11-14 meters (36-46 feet) below the mudline, and with Replacement Alternative N-6, the depth to bedrock would be approximately 6-9 meters (20-30 feet) below the mudline. In contrast, the depth to bedrock for Replacement Alternative S-4 would be approximately 67-71 meters (220-233 feet) below the mudline. Easier access to bedrock for Replacement Alternatives N-2 and N-6 (easiest for N-6) would allow for shorter piles, which would reduce the overall seismic load demands on the main span tower. For construction of Replacement Alternative S-4, the tower would need to be longer to reach bedrock, thereby subjecting it to greater stresses in an earthquake. Its design would need to be more massive to provide the same seismic resistance provided by a shorter tower for Replacement Alternative N-2 or N-6. As a result, the foundation would also need to be more massive to support the longer and more massive tower. The greater depth to bedrock and the larger foundation together would increase the area of excavation and the quantity of excavated material requiring disposal. Placing a key structural element of the bridge in over 60 meters (200 feet) of soft sediments would present substantial logistical challenges during construction.

- Replacement Alternatives N-2 and N-6 avoid conflicts with East Bay Municipal Utility District's (EBMUD's) facilities and operations. They would not conflict with the sewer outfall or its dechlorination facility. The outfall is a concrete pipeline 2.8 meters (9 feet) in diameter, and the onshore portion of the pipeline is buried 0.5 to 1.5 meters (2 to 5 feet) below ground surface. This shallow layer of cover does not provide adequate protection for the pipe; it is a zero-load facility, meaning that the pipeline cannot support any weight and must be protected or spanned to prevent damage. The alignment of Replacement Alternative S-4 would obliquely cross an onshore portion of the outfall pipeline. The skew angle between the roadway alignment and the outfall pipeline, buried under minimal cover from 0.5 to 1.5 meters (2 to 5 feet) deep, would result in a conflict area on land that is approximately 400 meters (1,300 feet) long. Protecting and avoiding this 2.8-meter (9-foot) diameter, zero-load pipeline would substantially increase construction complexity in this area, in terms of both bridge design and constraints on the contractor. It would also hamper any future inspections and repairs of either the outfall or the bridge. Damage to the onshore outfall during construction of Replacement Alternative S-4 could cause release of secondarily treated effluent containing elevated levels of chlorine into the Bay.

Replacement Alternatives N-2 and N-6 are the practicable alternatives pursuant to Section 404 of the Clean Water Act, and they are also feasible and prudent alternatives with the least net harm to Section 4(f) resources. Replacement Alternative N-6 has been chosen as the Preferred Alternative over Replacement Alternative N-2 on the basis of greater ease of construction of the main tower based on geologic conditions,

aesthetic benefits such as enhanced drivers' views, and consistency with the regionally preferred alignment and design features as expressed by the MTC.

2.3 REPLACEMENT ALTERNATIVES DESIGN VARIATIONS

Replacement alternatives are proposed as two parallel skyway structures, each having five traffic lanes, inside and outside shoulders, and a bicycle/pedestrian path on the south side of the eastbound deck. Design variations identified for the replacement alternatives are limited to the type of bridge to be constructed over the main navigation opening. For the portion of the span between the east side of the navigational channel and the Oakland Touchdown, a skyway design (a span supported from under the bridge deck) is the most practical structure type because of the alignment, the geology, the seismic characteristics, shallow water, and deep Young Bay Muds in that area. Other structure types could be built in this area; however, because of the site conditions, they would substantially increase design and construction costs and the time needed to construct. Designing these other structure types to a lifeline standard would also be much more difficult.

It has been determined that for the main span, steel would be used to construct the main tower and superstructure and a steel/concrete composite would be used to construct the substructure. For the skyway, concrete would be used for the superstructure and concrete or a steel/concrete composite would be used for the substructure. For the Oakland Touchdown portion of the bridge, concrete would be used to construct the superstructure and the substructure.

Selection of the superstructure type to be used for the bridge was based on seismic engineering and cost analyses, material availability, maintenance requirements, and impacts to construction schedule. To minimize costs, the span lengths were maximized, which increased load demands. While a 5-meter (16.4-foot) deep structure depth is sufficient for most of the span, it is insufficient to resist the bending and shear demands at the piers, so the superstructure had to be deepened at those points. As a result, a "haunched", or slightly arched, design was selected for the superstructure. This type of superstructure is thick at either end where it sits on a column. (See Figure 2-23 in Appendix A).

2.3.1 Main Span Types

For the replacement alternatives, design variations were considered for the main span section that crosses the main navigation opening. A number of bridge types, as discussed below, were evaluated by MTC's Bay Bridge Design Task Force Engineering and Design Advisory Panel (EDAP) based on seismic performance, aesthetic considerations, costs, ability to construct the bridge as soon as possible due to seismic vulnerability, and the possible location of a bicycle/pedestrian path. The public had an opportunity to participate during this process at 34 Task Force and EDAP meetings and through letters, phone calls, and e-mails received by MTC. In June 1998, based on the recommendations of the EDAP, MTC voted for a self-anchored suspension design that includes a single tower of 160 meters (525 feet) in height above MSL and maintains the main navigation opening east of YBI.

EDAP's recommendation was based on seismic safety and the aesthetic value of the bridge. The seismic safety of the self-anchored suspension design was judged to be equal to that of the single-tower, cable-stayed span; however, its aesthetic value was judged to be greater and more visually consistent with the tradition of suspension bridges in the central Bay. In addition, this design involves fewer long-term maintenance costs than the cable-stayed design variation evaluated by the EDAP and allows for the optimum location of the tower foundation while providing a wider shipping channel. (See Appendix E for further detail on the MTC recommendation process).

Replacement Alternatives N-2, N-6, and S-4 could accommodate any of the three variations discussed below, although the optimum locations for the main span foundations could not be provided by all replacement alternatives due to limited access to bedrock.

Cable-stayed Design

The cable-stayed design includes the use of steel cables to connect the bridge deck directly to towers. Most cable-stayed bridges have a single tower which supports both decks or separate "H" towers that support each individual deck. A single concrete vertical tower was considered for the East Span Project (see Figure 2-12 in Appendix A). Cable-stayed bridges have been used in several different countries since the 1940s. Recent examples constructed in the United States include the Sunshine Skyway Bridge in Tampa, Florida, and the Thomas Bridge in Georgia.

The cable-stayed system allows for longer spans crossing the navigational channel than could be provided with a skyway variation which requires additional piers in the channel. However, any cable-supported structure imposes additional alignment constraints. To support the two decks from a single tower, the decks of each of the parallel bridge structures must be almost parallel and at the same approximate elevation for the entire length of the main span. The main span cannot begin until each deck alignment meets these constraints. The replacement alternatives under consideration have been set to accommodate the geometric requirements for a cable-stayed main span.

The cable-stayed design variation would exceed the USCG's minimum requirements for horizontal and vertical clearances of the main navigation opening.

The cable-stayed main span was estimated to cost approximately $100-$250 million more than the total estimated cost of an island-to-shore skyway replacement bridge.

Suspension Bridge Design (Preferred Design Variation)

The suspension design is a commonly used design for long channel crossings and has been used previously in the Bay Area on the Golden Gate Bridge and the SFOBB West Span. A classic suspension bridge has cables that are draped from towers and connected to anchorages founded on the ground at both ends of the main span. Vertical cables ("suspenders") support the bridge by connecting the draped cable to the bridge deck. While bedrock on YBI could be used for a west anchorage, bedrock is approximately 135 meters (443 feet) below the mudline for an east anchorage at the

Oakland Touchdown. The use of ground-founded traditional anchorage structures at this bridge site is therefore considered less feasible and less cost-effective relative to other options.

A self-anchored suspension design variation has been identified as the preferred design variation. In a self-anchored suspension bridge, the main cables are anchored to the ends of the main span deck, eliminating the need for ground-founded anchorage structures (see Figure 2-13 in Appendix A). The self-anchored suspension design variation suspends the bridge from a steel tower. Alignment constraints for the self-anchored suspension design variation are similar to those described for the cable-stayed design variation. Decks of the bridge structures must be almost parallel and at the same approximate elevation for the entire length of the main span. The main span cannot begin until each deck alignment meets these constraints. Although a self-anchored suspension bridge looks similar to more conventional suspension bridges, it is structurally different in that it uses the bridge deck as the integral structural component that balances the force usually taken by anchorages founded on the ground. The replacement alternatives under consideration have been set to accommodate the geometric requirements for a self-anchored suspension design variation.

The self-anchored suspension design variation exceeds the USCG's minimum requirements for horizontal and vertical clearances of the main navigation opening.

The self-anchored suspension main span was estimated to cost about $150-$300 million more than the total estimated cost of an island-to-shore skyway replacement bridge.

Skyway Design

The skyway design variation is a structure constructed of precast concrete supported by columns. With this structure type, eastbound and westbound bridges would be constructed as separate, independent structures. Under the skyway design variation, spans over the main navigation opening area could be a maximum of 150-170 meters (490-550 feet) in length. The skyway design variation would require three spans in the main span area, compared to two spans for both the cable-stayed and self-anchored suspension design variations. The skyway design does not require a complete tangent or straight section over the main span, which is needed to construct the cable-supported design variations. As a result, there could be a slight curve in the main span. An example of a skyway structure is depicted in Figure 2-14 in Appendix A.

The skyway design variation would meet but not exceed the USCG's minimum requirements for horizontal and vertical clearances of the main navigation opening.

A skyway design variation is considered as the baseline for cost comparison purposes. A skyway span was estimated to cost approximately $90 million.

2.4 COMPARISON OF ALTERNATIVE CHARACTERISTICS

2.4.1 Funding

The base budget for the East Span Project, established in Section 188 of the California Streets and Highways Code (CSHC), is about $1.285 billion. Project funding comes from a combination of state taxes, bond revenues, and moneys collected through a one-dollar bridge toll surcharge effective January 1, 1998, on all state-owned bridges in the Bay Area. Some federal funding is also being sought for the project. State taxes, in the form of state fuel tax revenues, are 33.3 percent of the project budget, state Seismic Retrofit Bond revenues will fund 30.2 percent of the budget, and the toll surcharges from state-owned Bay Area toll bridges will fund the remaining 36.5 percent.

The legislation creating the funding mechanism for the East Span Project established the Bay Area Toll Authority (BATA) (with the same board as the Metropolitan Transportation Commission) and authorized the Authority to collect the one-dollar toll surcharge for eight years, issue revenue bonds, and allocate revenues to toll bridge projects, including the East Span Project. On June 24, 1998, through BATA Resolution No. 10, the Authority chose to extend the one-dollar toll surcharge for an additional two years beyond the eight years to fund the inclusion of specified amenities. Extension of the toll surcharge for 15 months is anticipated to generate $230 million; amenities specified in Resolution No. 10 total $141 million: $50 million for a bicycle/pedestrian path and $91 million toward the self-anchored steel suspension main span. On September 22, 1999, through BATA Resolution No. 19, the one-dollar toll surcharge was extended for an additional 0.4 months to pay for rest areas, a planning and feasibility study of a West Span bike lane, and a concept study of improvements to the Transbay Transit Terminal. The incorporation of the two resolutions results in a $1.427 billion budget for the SFOBB East Span Project.

On June 28, 2000, the Authority approved a revision to BATA Resolution No. 19 to extend the surcharge for the remaining 8.9 months permitted by statute to fund the additional costs of the Bay Bridge West Span bicycle and pedestrian study ($1,020,000) and for the remainder ($84,430,000) to be placed in a reserve account.

The total base budget of $1.285 billion includes an allocation of $80 million for a cable-supported structure. The type of cable-supported structure is not specified in the CSHC. The design options presented in Section 2.3 include cable-supported structures. Funding of a cable-supported system costing more than $80 million would require the Authority to extend the one-dollar toll surcharge beyond the initial eight-year period.

Cable-supported design variations are included in the East Span Project description of replacement alternatives. The potential visual impacts of these design options are addressed in this document.

2.4.2 Costs

Estimated total costs for each of the alternatives identified above are listed in Table 2.4-1. These costs are based on 1998 estimates and are presented in 2002 dollars. Comparative life-cycle costs are presented in Table 2.4-2. These cost estimates are conceptual and are based on available information that was available in 1998 about the existing East Span, new proposed alignments, existing utilities, historic construction costs, and quotations from various local suppliers and contractors. These estimated costs range from zero for the No-Build Alternative to $1.65 billion for Replacement Alternative N-6, suspension design option. No-Build Alternative costs do not include the $19 million interim retrofit improvements that were completed during summer 2000.

In April 2001, Caltrans published updated cost information for the Preferred Alternative (Replacement Alternative N-6, suspension bridge design option). It reflects cost increases due to such factors as increasing construction costs in a robust and competitive local economy; significant increases in the costs of steel; schedule delays which magnified the inflationary effect; and additional design amenities such as the belvederes and a wider bicycle path than is standard. Caltrans estimates that the current cost of Replacement Alternative N-6, suspension bridge option, would be $2.6 billion.

Caltrans did not prepare updated cost estimates for the other project alternatives in April 2001. However, the most significant factors contributing to increased costs would apply to all of the build alternatives.

The enabling legislation for the project, Senate Bill 60, signed by then-Governor Pete Wilson in 1997, anticipated the possible need for additional funding beyond original estimates and required Caltrans to return to the Legislature if necessary. In accordance with Senate Bill 60, Caltrans has submitted its cost estimates to the Legislature and anticipates that it will address the need for additional funding within the next few months.

Based on a comparative cost study prepared by Caltrans in 1996, it is estimated that the bridge maintenance costs for the retrofit alternative over the projected 50-year life span of the existing structure would be $44 million. A replacement structure is expected to have a service life of 150 years. Life-cycle costs of replacement alternatives have not been developed for the projected 150-year life spans of the structures. A comparison of selected maintenance operations and repairs of the first 50 years of service indicated that differences among replacement alternatives are small (see Table 2.4-2). Comparing the life-cycle costs of the replacement structure in Table 2.4-2 to the maintenance costs of the retrofit structure

Table 2.4-1 Cost Estimate Summary

Alternative	Retrofit Existing Structure	Skyway ($ billion)			Cable-stayed Main Span Design Variation ($ billion)			Self-anchored Suspension Design Variation ($ billion)		
Alternative		N-2	N-6	S-4	N-2	N-6	S-4	N-2	N-6 (Preferred)	S-4
Structure and Roadway[a]	0.90	1.25	1.25	1.25	1.35 - 1.45	1.35 - 1.45	1.40 - 1.50	1.45 - 1.50	1.40 - 1.55	1.45 - 1.50
Dismantle Existing East Span	N/A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Bicycle/Pedestrian Path	N/A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Aesthetic Lighting	N/A	N/A	N/A	N/A	0.012	0.02	0.012	0.015	0.02	0.015
TOTAL Construction Cost[b] ($2002)	0.90	1.35	1.35	1.35	1.45 - 1.55	1.45 - 1.55	1.50 - 1.60	1.55 - 1.60	1.50 - 1.65	1.55 - 1.60

Source: SFOBB East Span Seismic Safety Project 30% Type Selection Report, Caltrans, May 1998.

Notes: [a] Cost estimates reflect the potential range in construction costs depending on skyway structure type rounded to the nearest 50 million. A haunched-concrete skyway structure is estimated to have the least cost, a uniform depth concrete skyway a mid-range cost, and a uniform depth steel structure the greatest cost.

[b] The cost information in this table represents the estimated cost of the various alternatives in 1998. The costs are relative to each other at the time that they were estimated. They do not represent the current costs of the alternatives, which would be greater, but still have the same relative relationship.

Table 2.4-2 Comparative Life-cycle Costs[a,b] ($ Million Escalated to 2002)

Skyway	Cable-stayed Main Span Design Variation	Self-anchored Suspension Design Variation
11	14	12

Source: SFOBB East Span Seismic Safety Project 30% Type Selection Report, Caltrans, May 1998.

Notes:
[a] Comparative life-cycle cost analysis estimates costs of maintenance and repair of the bridge over a projected life span (150 years) to better determine the overall bridge structure "value." A comparative analysis requires calculation of life-cycle costs of only those maintenance operations and repairs that are appreciably different for bridge design variations that are being evaluated. The table only reports costs for the first 50 years of the life span because beyond that period, it becomes increasingly difficult to make reliable estimates.
[b] For purposes of comparative life-cycle costs, differences between replacement alternatives were minimal.

($54 million in 2002 dollars) means that a new bridge, which would last 100 years longer, would be less expensive to maintain over the long term.

2.4.3 Constructibility

In addition to cost, "constructibility" provides a valuable comparison between the alternatives and options previously described. Constructibility encompasses the anticipated duration of construction, as well as any unusual delays, environmental issues, or risks associated with the construction process. The environmental impact issues are discussed in Section 4.14 — Temporary Impacts During Construction.

The No-Build Alternative would have no construction activity. Tasks would be limited to regular maintenance.

The Retrofit Existing Structure Alternative would include constructing two new columns in Bay waters to support the main span over the navigational channel. A total bridge closure would be necessary to connect the new columns to the cantilever section. This could be accomplished at night. During other activities, such as superstructure construction, numerous lane closures would be necessary but would be timed to minimize the impact on bridge users. Construction on the superstructure would be expected to last for the majority of the retrofit schedule, approximately six years.

The Retrofit Existing Structure Alternative is less safe for the traveling public and for Caltrans staff who will maintain the bridge during and after construction. Because there are no shoulders on the existing East Span, the construction zone for the retrofit would be highly constrained. Motorists would pass within close distances of the construction activities through the entire 4-kilometer (2.5-mile) long project, and construction equipment and workers would have to maneuver adjacent to passing traffic for the installation and removal of lane closures and other work on or above the five lanes.

Multi-staged construction and temporary detours would be required on YBI and the Oakland Touchdown area for all three replacement alternatives. Most of the construction in the Bay can be performed without affecting the existing roadways and bridge structure. The vast majority of the construction would be separated from the existing East Span. This separation would minimize traffic delays and safety hazards for construction crews, maintenance crews, and the traveling public. Caltrans is continuing to investigate lane and bridge closures to transition traffic from the existing bridge to the temporary detours and to a replacement bridge. Caltrans would plan the closures in an effort to simultaneously minimize public inconvenience, facilitate construction, and maximize public safety. The closures would be scheduled to occur during off-peak hours to the maximum extent feasible. Caltrans would implement a Traffic Management Plan to manage impacts to traffic.

A replacement alternative would also provide two standard shoulders to accommodate disabled vehicles and routine bridge maintenance activities. The replacement alternatives are expected to take five years to complete plus approximately two years to dismantle the existing structure, for a seven-year construction schedule.

2.4.4 Ability to Address the Project Purpose and Need

The No-Build Alternative would not meet the project purpose and need as described in Chapter 1 because it would not provide a lifeline vehicular connection between Oakland and YBI; would not maintain high levels of people, freight, and goods movement following an MCE; and would not correct deficiencies in design standards. The retrofit and replacement alternatives would meet the project purpose and need to varying degrees as summarized below.

The Retrofit Existing Structure Alternative would retain the vehicular connection between YBI and Oakland and would maintain the current vehicular capacity of the East Span. It would improve the seismic performance of the existing structure, enabling the bridge to withstand a seismic event, and potentially an MCE; however, it would not meet lifeline criteria. In the event of an MCE, it is anticipated that major damage to the bridge could occur. Post-earthquake repair of the bridge could require closure of the SFOBB for several months, removing the SFOBB as a transportation link and, if damage is excessive, impeding the bridge's ability to provide emergency relief access. Replacement or repair of the bridge following an earthquake could require closure of the SFOBB for years, depending on the degree of damage.

Opportunities to improve operational safety elements of the East Span would not be possible under the Retrofit Existing Structure Alternative. The retrofit alternative would not permit changes to the existing roadway design; therefore, current roadway design standards could not be attained (see Section 1.2.3 — Current Roadway Design Standards).

Each of the replacement alternatives would continue to provide a connection between YBI and Oakland and would provide a lifeline connection between West and East Bay communities. The replacement alternatives would be constructed to withstand an MCE, providing for safety of bridge users during an earthquake. As a lifeline structure,

the span would continue to provide a critical connection between San Francisco, the East Bay, and the I-80 corridor to the east. The span would provide post-earthquake transportation service for emergency response and support for the economic livelihood of the Bay Area.

The replacement alternatives would meet current roadway design standards to the maximum extent feasible. Replacement alternatives would maintain existing vehicular capacity on the East Span by providing five travel lanes in each direction, including provision of standard 3.6-meter (12-foot) wide traffic lanes and inside and outside (3-meter [10-foot]) shoulders. The replacement alternatives would also conform to current horizontal and vertical alignment, superelevation, clearance, and stopping-sight distance standards as defined in Section 1.2.3 — Current Roadway Design Standards of this report.

2.5 ACCOMMODATION OF MULTI-MODAL STRATEGIES

The SFOBB is within an important corridor of transbay travel between San Francisco and the East Bay. The bridge is currently a multi-modal highway facility that is used by public and private vehicles, trucks, buses, carpools, and vanpools. The corridor is also served by Bay Area Rapid Transit (BART), which provides rapid rail service via the submerged BART "tube," and a network of ferries.

Based on available data, approximately 36,000 people travel through the Transbay Corridor during the weekday morning peak hour in the peak direction (westbound). The following table summarizes existing person trips in the Transbay Corridor by mode:

	Single-/Double-Occupant Vehicles	**Carpools/ Vanpools**	**Buses**	**BART**	**Ferries**	**Total**
Number of Person Trips (AM peak hour, westbound)	8,900	9,400	3,100	14,000	400	35,800

Source: Caltrans, September 1997, June 1998, and May 2000.

Because the SFOBB is a critical regional facility whose approaches are severely congested during peak periods, the feasibility of incorporating an additional high-occupancy transportation facility within the corridor (either road- or rail-based) was evaluated. The purpose of such a facility would be to increase mobility within the corridor.

Due to the scale of the project, some members of the regional community urged that congestion relief be included as part of the project purpose in addition to providing a vehicular lifeline connection. The scope of the project was not expanded to include congestion relief, because this would have resulted in lengthy public and agency debate about how best to implement a congestion relief solution. This would have

caused the seismic safety component of the project to be substantially delayed. Caltrans anticipates beginning construction of this critical safety project in fall 2001. This would not have been possible if the scope of the project had included congestion relief.

2.5.1 Historical Background

Rail service was provided on the SFOBB from 1939 to 1958 by the Key System. The Key System was an electrified interurban light-rail system that utilized the south side of the lower deck of the East and West Spans of the SFOBB. It shared the lower deck with trucks and buses while automobile traffic only traveled in six lanes on the upper deck. The Key System commenced operation in 1939 and continued service until 1958. From 1939 to 1941, two other rail lines, the Interurban Electric and the Sacramento Northern, also operated on the SFOBB.

The Key System connected Oakland and Berkeley with San Francisco. The system terminated in San Francisco at the Transbay Transit Terminal where passengers could transfer to the San Francisco Municipal Railway system (Muni). In total, the Key System trains operated on 106 kilometers (66 miles) of track on the SFOBB and in the East Bay. It served the East Bay cities of Richmond, El Cerrito, Albany, Berkeley, and Oakland. The Key System also operated transbay buses.

Patronage on the Key System peaked in 1945 with 26.5 million annual passengers, with an average daily ridership of about 102,000 (including both trains and Key System buses). By 1957, ridership had declined to about 5.2 million annually (about 17,000 average daily riders).[1] As a result of the decrease, the Key System rail lines were abandoned, and the routes were converted to Alameda-Contra Costa Transit District (AC Transit) bus service in 1958.

When Key System rail service ended, the lower deck of the SFOBB was converted to automobile use. To accommodate these changes, substantial modifications were made in San Francisco, on the SFOBB, and in the Oakland Touchdown area. New vehicle access to and from the SFOBB was constructed in San Francisco; tracks at the Transbay Transit Terminal were converted to bus lanes, and buses were rerouted onto the former rail access in the Terminal; track, ties, and other railroad facilities were removed from the lower deck of the SFOBB; and new roadways to and from the SFOBB were constructed in Oakland. Load capacity from the rail system was used to allow modern traffic loadings on the bridge, including truck traffic in any of the lanes on the top deck.

[1] Demoro, Harre W., *The Key Route: Transbay Commuting by Train and Ferry*, 1985.

2.5.2 MTC SFOBB Rail Feasibility Study

Background

In November 1998, voters in the cities of San Francisco, Berkeley, Oakland and Emeryville passed an advisory ballot measure requesting that the feasibility of passenger rail on the SFOBB be studied by MTC. In response to this measure and general public interest, MTC studied transit service options in the Transbay Corridor, especially the possibility of rail (see MTC letter dated December 16, 1998, that was sent to the Mayors of Berkeley, Emeryville, Oakland, and San Francisco in Appendix G). Concurrently, MTC prepared two studies: a long-term capital and operating cost analysis for various transit options for the Transbay Transit Terminal, as well as a feasibility analysis of rail on the SFOBB. Because the SFOBB and the Transbay Transit Terminal are linked by function, the technical analyses conducted in each study have been coordinated and are based on shared assumptions and data.

There are two phases in the Bay Bridge Rail Alternatives Study. Phase I explored the technology options for placing rail on the SFOBB and assessed the structural feasibility and modifications that would be required for the retrofitted West Span, YBI and the new East Span of the SFOBB as currently proposed. Phase I also identified potential SFOBB rail alignments in the East Bay and in San Francisco. A final report was completed in July 2000.

The work scope for Phase II of the study will be incorporated into the Bay Crossing Study to be completed by MTC by fall 2002. MTC will study non-SFOBB transbay rail crossings, including new tubes for rail or BART, additional or expanded auto bridges with or without rail, and enhancements to existing transbay transit services, including BART, transbay buses, and ferries.

The following working papers and final report were prepared for MTC's SFOBB Rail Alternatives Study:

- Working Paper 2A.2: "Initial Definition and Description for Bay Bridge Rail Options," July 28, 1999;
- "Structural Assessment of Rail on the Bay Bridge: Summary Report," October 22, 1999;
- Working Paper 2A.3: "Structural Assessment of Rail on the Bay Bridge," October 22, 1999;
- Working Paper 3A.1: "Operational Description of Bay Bridge Rail Alignment Options," Draft, November 29, 1999; and
- Final Report, "Bridge Rail Feasibility Study," July 2000.

These documents are available from the MTC Library, 101 8th Street, Oakland, California.

MTC Findings

Structural Feasibility and Costs. The structural feasibility of rail on the SFOBB was analyzed in the MTC study. This study analyzed four types of rail vehicles: light rail

(LRT), BART, commuter rail, and high-speed rail. These vehicles vary by their loaded car weight and the rail envelope size.

The East Span replacement alternatives, as currently being designed by Caltrans, would have the structural capacity to accommodate one railroad track for LRT on the inside of each deck (north side of eastbound deck, and south side of westbound deck), four travel lanes with no shoulders, and live loads representing BART and LRT vehicle types. The MTC study found that additional strengthening beyond the established design criteria would be required if five travel lanes or vehicle types with higher live loads were desired. The placement of rail on the inside of each of the side-by-side decks limits the options for crossing YBI and connecting to the West Span. The MTC study notes that "...moving rail to the outside of the decks would provide the needed flexibility, allowing for new tunnel bores to be constructed without impacting current traffic operations."[2]

The MTC study also observes that the feasibility of an SFOBB rail system would also be constrained by the structural requirements for rail on the West Span. The MTC structural assessment study identified two rail configurations that would accommodate rail on the West Span. Both configurations would require extensive modifications, in addition to the West Span retrofit that is currently under way. The cost for the modifications would range from $3.06 billion (Rail Suspended Below the West Span Lower Deck option) to $3.33 billion (Rail Cantilevered from the West Span Lower or Upper Decks option). These estimates include the cost of strengthening and modifying the West and East Spans to accommodate rail and four travel lanes, new tunnels through YBI, and a new tunnel or structures to Harrison Street in San Francisco. The costs do not include a structure to carry rail beyond the SFOBB Toll Plaza, structure or tunnel to the Transbay Transit Terminal in San Francisco, or costs of the rail tracks or other infrastructure to operate a rail system.

Rail Service Options. The MTC study identified four rail service options for operating rail on the SFOBB. The study notes that these options would serve different, potentially large markets but were not based on detailed analyses of demand or potential patronage.

Alternative A – Transbay Light Rail Service. This option, considered a modern version of the Key System, would connect the Transbay Transit Terminal with several trunk lines in the East Bay with LRT. Frequent all-day service would be provided.

Alternative B – BART Transbay Bridge Service. This option would take one of the existing transbay BART lines and move it to the SFOBB, expanding the capacity of BART's peak hour transbay service. For purposes of the MTC analysis, it was assumed that the SFOBB BART would connect to the bridge via a direct connection with BART's MacArthur station.

[2] Metropolitan Transportation Commission, "Structural Assessment of Rail on the Bay Bridge," Working Paper 2A.3, October 22, 1999.

Alternative C – Basic Bridge Railroad Passenger Service. This option identifies rail service that would link the Peninsula and the East Bay via the Transbay Transit Terminal and the SFOBB. Both electrified commuter rail and high speed trains would operate on this alignment on a skip-stop "A-train/B-train" operating plan, as described in MTC's "Blueprint" concepts for Caltrain.[3] "A" and "B" trains would operate on 30-minute headways, resulting in 15-minute headways between major stations. In the East Bay, commuter rail trains would merge with the existing Union Pacific corridors both north and south of the SFOBB. To the north, some of the trains would extend to Sacramento as part of Capitol Corridor service. High speed rail would terminate at a new station in West Oakland.

Alternative D – Aggressive Bridge Railroad Passenger Service. This option is basically identical to Alternative C. However, for Alternative D, the northern "A" and southern "B" branches would extend beyond central East Bay core cities. Frequency of service would also be improved. Northbound trains would continue to Martinez with half of the trains continuing to Suisun-Fairfield. Some trains would be extended to Sacramento. High speed trains would operate over the SFOBB every 30 minutes, with every train continuing to Sacramento. The southbound commuter rail line would extend to San Jose.

Rail Infrastructure and Rolling Stock Costs. The MTC study estimated the capital costs of implementing each of the rail options, including infrastructure and rolling stock. Operational costs were not included in these estimates but they would be substantial. Total infrastructure and rolling stock cost estimates are summarized below:

- Alternative A - $1.6 to 1.8 billion
- Alternative B - $1.94 billion
- Alternative C - $918 million
- Alternative D - $4.77 billion

Therefore, the MTC study estimated that the total cost of rail implementation, including bridge structural modifications, rail infrastructure, and rolling stock would be between $4 billion and $9 billion.

Structurally, rail is feasible on the SFOBB; however, there are numerous non-structural issues that have not been examined, such as system-wide operations, routing, costs, attaining ridership, acquiring right-of-way, and resolving environmental issues.

2.5.3 Operational Issues

This section evaluates the potential operational impacts of implementing an HOV lane or rail on the East Span.

In general, the existing East Span or a replacement span could physically accommodate an HOV lane without additional right-of-way. A replacement East Span,

[3] Metropolitan Transportation Commission, "Transportation Blueprint for the 21st Century," March 1999.

as currently designed, could also accommodate rail service. Rail service would require the use of one travel lane in each direction, reducing the capacity of the East Span to four travel lanes. Significant modifications to the current design would be necessary to accommodate rail service and five travel lanes.

The operational impacts on vehicular flows due to the loss of one travel lane with either multi-modal strategy are described below.

HOV Lane

An HOV lane on the SFOBB is evaluated as an extension of the existing HOV facilities at the San Francisco and East Bay approaches. Under this scenario, one of five mixed-flow lanes on the SFOBB (in both the eastbound and westbound directions) would be converted to an HOV lane. The HOV lane would be a dedicated facility for use only by vehicles with three or more people. Because right-of-way constraints on the existing or replacement East Span would preclude the use of barriers or buffers, the facility would be separated from mixed-flow traffic by striping and signing only.

An HOV lane on the SFOBB would adversely affect mobility in the Transbay Corridor, compared to the SFOBB facility without an HOV lane. During the morning peak period, the existing HOV lanes and metering signals at the SFOBB Toll Plaza operate together as a system to ensure that the capacity of the five westbound lanes on the SFOBB is maximized. As the HOV lane volume varies during the peak period, the mixed-flow metering rates are adjusted accordingly to maintain capacity flow for five lanes on the bridge. During the peak hour when the HOV volume exceeds the capacity of a single HOV lane, total vehicular capacity could be maintained if one of the five lanes on the bridge is operated as an HOV lane. The metering signals would release fewer mixed-flow vehicles as the excess HOV demand shifts into the mixed-flow lanes. However, the HOV volume before and after the peak hour would be less than the capacity of an HOV lane. Since mixed-flow vehicles would be restricted from using the HOV lane, total vehicular capacity would be less than the existing capacity as the excess HOV lane capacity would go unused. This would result in additional congestion on the approaches to the SFOBB. It is likely that the additional congestion would increase to the point of restricting access to the HOV lanes, particularly for the I-580 and I-880 approaches.

Other constraints associated with implementing the HOV lane on the SFOBB would be the result of the physical integration of the lane with existing HOV lanes, ramps, and SFOBB approaches. Substantial physical modifications, such as an HOV flyover (to connect the existing westbound HOV lanes, including the HOV flyover constructed as part of the I-880/Cypress Freeway Replacement Project, with a new HOV lane) and/or new ramps at YBI, would be necessary to minimize impacts to traffic flow operations. Therefore, costs associated with implementation of the HOV lane could be substantial and there would be no net change in person trip throughput on the bridge.

Rail

If rail on the SFOBB were implemented, one travel lane and one shoulder in each direction on the East Span would need to be converted to rail use. The loss of a traffic lane on either span would substantially impact SFOBB traffic operations. The vehicular

capacity of the proposed East Span would be reduced by 20 percent. However, to accommodate rail on the existing West Span deck, it would need to occupy two travel lanes, reducing the vehicular capacity by 40 percent. This is because the West Span does not have shoulders. Consequently, the vehicular capacity of the East Span would also be reduced by 40 percent because traffic flow on the East Span would be constrained by the lowest capacity available in the corridor. As a result, about 7,300 morning peak-hour westbound person trips (4,000 vehicle trips per hour) would be displaced. (These figures are based on counts taken by Caltrans in May 2000 at the SFOBB Toll Plaza.) If this significant loss in vehicle capacity was not made up through rail ridership, it would increase the existing congestion levels on the approaches to the SFOBB for mixed-flow vehicles, as well as create delays for vehicles accessing the existing HOV facilities.

To maintain or increase the person throughput capacity of the SFOBB due to the loss of vehicle capacity as a result of rail on the bridge, the rail system must attract all of the displaced person trips (about 7,300 morning peak-hour, westbound person trips).[4] The ability of the rail system to attract new transit trips is not solely dependent on the SFOBB segment; instead, the rail system must provide a superior mode choice in terms of travel time, convenience, cost, and reliability compared to driving. It must also not duplicate service already provided by either AC Transit, BART, or ferries. These factors would limit the number of displaced person trips to be attracted to the rail system. Further, to be successful, any new rail system would need a supporting feeder infrastructure. Rail lines, terminals, parking areas, and new bus lines would need to be developed to deliver riders to the system. Future improvements on the other existing modes would also affect new rail system ridership by providing capacity increases in the corridor. The implementation of BART's Advanced Automatic Train Control (AATC) will allow BART to increase its capacity to 21,000 passengers during the peak hour.[5] The AC Transit Transbay Comprehensive Service Plan calls for 140 westbound, morning peak-hour buses in the future, about an 80 percent increase over existing levels.

2.5.4 Institutional and Funding Issues

Institutional and funding issues related to implementation of either a road-based or a rail-based multi-modal strategy are summarized below.

- **Multi-modal strategies have not been identified as necessary in any regional planning process or document.** MTC is the regional agency responsible for programming, transportation planning, and financing within the

[4] A Transbay Corridor LRT system with a passenger capacity of 6,800-7,800 passengers per hour per direction could offset the displaced person trips if all train cars were filled to capacity. Such a system could have the following characteristics: units with a maximum capacity of 135-155 passengers per train car, trains of up to four vehicles in length, and peak-period headways of five minutes or less. A Transbay Corridor system may have different characteristics depending on the technology and equipment chosen for the system. It is important to note that it is not known without further study if ridership on a Transbay Corridor system would reach capacity levels.

[5] 30 transbay trains per peak hour x 10-car train lengths x 70 seats = 21,000 peak-hour passengers. Source: Bay Area Rapid Transit, "FY 2001 Short Range Transit Plan, Draft," May 2000, and "The Capital Improvement Program, FY 2001, Draft," May 23, 2000.

nine-county San Francisco Bay Area. It functions both as the regional transportation planning agency and as the region's MPO. These designations are mandated through state and federal legislation, respectively.

The SFOBB is a component of the I-80 Corridor, an important corridor in the Bay Area for commute travel, freight movement, and recreational travel. It has been studied extensively by regional planning organizations such as MTC and local transit agencies. These studies include:

- MTC's Bay Crossing Study (1991);
- HOV Lane Master Plan (1997);
- Interstate 80 Corridor Study (1987);
- Phase I ACR 132 Intercity Rail Corridor Upgrade Study (1989);
- Greater East Bay Rail Opportunities Coalition's Commute Rail Operating Plan (1994);
- AC Transit's Alternative Modes Analysis (1993);
- Transbay Comprehensive Service Plan (1998);
- Caltrans' Rail Passenger Program Report 1993/94 - 2002/03 (1993);
- California High Speed Rail Commission studies;
- MTC's Blueprint for the 21st Century (1999); and
- MTC SFOBB Rail Alternatives Study (2000).

These studies identified existing and future system deficiencies and travel demand and evaluated improvement strategies, such as HOV lanes, improved ferry service, LRT corridor identification, and commuter rail service. None of these studies has identified an HOV lane or a rail-based system on the SFOBB as a preferred improvement strategy, although AC Transit has requested that Caltrans study an HOV lane on the SFOBB. Caltrans evaluated such a facility in October 1994.[6] The MTC SFOBB Rail Feasibility Study identified preliminary estimates of the cost of SFOBB rail, structural modifications to the East and West Spans, and possible service operating scenarios. The study did not estimate potential ridership or identify environmental constraints.

Because none of these studies has identified an HOV lane or rail on the SFOBB as a preferred strategy, neither of these multi-modal strategies has been included in either the Track 1 or Track 2 project lists of the MTC's 1994 RTP or its 1996 and 1998 updates, including a 1999 amendment.[7] The planning horizon for the RTP is 20 years. MTC could include the multi-modal strategies in subsequent RTPs if the projects are consistent with local and regional objectives and strategies for

[6] Caltrans District 4 Highway Operations, *Effects of Proposed Changes to Bay Bridge HOV Operation*, October 19, 1994.

[7] The Regional Transportation Plan, which MTC prepares, is a comprehensive guide for the development of mass transit, highway, airport, seaport, railroad, bicycle, and pedestrian facilities within the Bay Area for the next 20 years. Track 1 refers to the list of regional transportation projects financially committed to in the past, as well as projects that maintain and operate the existing transportation infrastructure. Track 2 projects are regional transportation projects that do not yet have regional consensus or complete funding. MTC also allocates state and federal funds for transportation projects based on compatibility with this plan. The RTP is updated every two years through a public participation process to reflect a changing funding picture and the changing status of projects in Track 1, as well as to address new findings that emerge from corridor studies and Track 2 consensus building.

congestion management. In addition, neither multi-modal option was included in a recently enacted statewide funding package for transportation improvements (Governor's Traffic Congestion Relief Program [TCRP], July 2000).

- **No funding has been programmed or identified for either strategy.** MTC recently estimated the cost to implement rail on the SFOBB to be between $4 and $9 billion, depending on the technology used, and the infrastructure and bridge structural modifications required. The structural modifications to both the proposed East Span and West Span to accommodate rail would cost between $3.06 and $3.3 billion. The MTC study noted that heavy rail could be accommodated on the East Span with significant and costly modifications to its current design.

  No cost estimates have been prepared for implementation of an HOV lane on the SFOBB but they would likely be less than rail. Costs may include modifications to existing ramps or construction of new ramps; these costs may be substantial.

  The construction and operation of the facilities required to implement an HOV lane or rail system would require additional funding and sources of funding beyond those committed to the East Span Project. Replacement bridge types and amenities for which funding has been allocated by state legislative action do not include construction of HOV or rail systems (see Section 2.4.1 — Funding). Other local, regional, state, and federal sources fund multi-modal projects. However, since costs to build, operate and maintain the existing local and regional transportation system exceed available transportation funding sources by $7 billion over the next 20 years, it is assumed that existing sources of revenues would remain committed in the foreseeable future to support existing transit services and expenditure priorities.[8] Commitment of new potential funding and funding sources for multi-modal projects on the SFOBB will depend on the political and economic environment in the future.

- **Both strategies would require new institutional arrangements to implement and operate the facilities.** Neither the HOV lane nor a rail system is currently identified as a regional transportation priority. Before either can be included in the RTP, new institutional arrangements would be required, such as the identification of a governing body to operate the rail system. This body would not be created until there is regional consensus and agency interest in the strategies. This consensus does not currently exist.

The East Span Project's purpose is to provide a seismically upgraded vehicular crossing between YBI and Oakland. Although multi-modal strategies were evaluated as part of the alternative definition process, no multi-modal strategies are within the purpose and scope of the SFOBB East Span Project.

The East Span Project would maintain the current vehicular capacity of the existing East Span. The implementation of any multi-modal strategy on the SFOBB would be

[8] Metropolitan Transportation Commission, "1998 Regional Transportation Plan for the San Francisco Bay Area," August 1998.

subject to independent evaluation and funding as a separate project in the future. Not all rail systems could be accommodated by the East Span Project without significant modifications to the currently proposed design; however, the East Span Project does not create any additional obstacles to implementing a rail project, or other technologies, in the Transbay Corridor in the future.

The near-term implementation of either a road- or rail-based high-occupancy transportation multi-modal strategy would be constrained by several factors. Planning, funding, and implementing new transit services, which would be integrated with the existing transportation system in the Bay Area, would take substantially longer than the East Span Project would take to build. Implementing an HOV lane or rail-based transit facility on the East Span without additional infrastructure improvements, such as grade-separating structures or barriers, would adversely impact traffic operations on the approaches at either end of the bridge.

2.6 CONSTRUCTION ACTIVITIES

Similarities Between Construction of Alternatives

The retrofit and replacement alternatives have similar construction issues with respect to scale of work, in-water construction, and extent of laydown areas on YBI and the Oakland Touchdown area.

Scale of Work

Construction of the retrofit and replacement alternatives would require use of large-scale construction equipment and would involve labor-intensive construction activities. Noise emitted from driving large piles would be similar for the retrofit and replacement alternatives. The construction period for all build alternatives is anticipated to be approximately 6-7 years, including dismantling of the existing bridge under the replacement alternatives.

In-Water Construction

For all build alternatives, barges would be used for material delivery, dredging, drilling, pile driving, lifting, pile extraction, constructing cofferdams, and dismantling. Special barges and lifting equipment would be used to accommodate heavy equipment needed to support large-scale pile drivers. In areas of shallow water, some construction would take place from trestles and barges, and in deeper water, construction would take place from barges.

In-water construction activities would have similar impacts on the movement of commercial vessels and recreational boats, which would be diverted from construction areas. The main navigation opening near YBI would remain open during construction. The width would be reduced during construction, but not less than the minimum width required by the USCG.

Dredging would be required for portions of both the retrofit and the replacement alternatives for excavation, for cofferdams, and to accommodate barge access because some locations have water depths that are shallower than the draft of a barge. The anticipated maximum draft for the barges is 3 meters (10 feet). To ensure

adequate clearance over potential irregularities in channel depth, to allow for some potential resettlement of materials in the channel after dredging and ""listing of barges during heavy lifts, the channel would be dredged to a depth of 3.6 meters (12 feet) adjacent to the Oakland Touchdown and 4.3 meters (14 feet) for the rest of the access channel. Dredging to a depth of 4.3 meters (14 feet) would also be required northeast of the USCG facility on YBI for Replacement Alternative S-4.

Construction Staging Areas on Yerba Buena Island and Oakland Touchdown

Construction laydown and access areas would be needed on YBI and at the Oakland Touchdown area for construction storage and staging. The entire eastern end of YBI would be required, except for Building 262 and the structures and some landscaped areas in the Senior Officers' Quarters Historic District. A dock and vessel mooring facility would be constructed near the Parade Grounds and/or offshore from the eastern end of the island to facilitate the delivery of material and equipment from barges. Access to the Oakland Touchdown construction area would most likely be from surface streets located south of I-80, such as Burma Road.

2.6.1 Retrofit Existing Structure

Retrofit construction would require large-scale construction equipment and labor-intensive construction activities. Equipment used for construction of the retrofit would include delivery trucks, cranes, barges, dredges, pile drivers, concrete mixers, batch plants, cofferdams and forms, excavators, backhoes, and manual equipment to remove rivets and add bolts. The sequencing of work would depend largely on the contractor, but it is anticipated that construction activity would not be in progress concurrently along the entire length of the existing bridge. Construction is estimated to require six years to complete.

A possible construction scenario for the retrofit alternative is summarized below. Activities are described for three distinct construction areas: YBI, the Oakland Touchdown area, and in the Bay. Additional information on construction activities, impacts, and avoidance and minimization measures can be found in Section 4.14 — Temporary Impacts During Construction Activities.

Yerba Buena Island

Equipment, materials, and work crews would be transported to YBI by motor vehicles and/or barges. Contractors would require construction laydown and access areas on YBI to retrofit the YBI East Viaduct and retrofit Columns YB2 through YB4 and E1 (Figure 2-4.1 in Appendix A) and for construction storage and staging for the entire retrofit. The contractor would be responsible for arranging additional space requirements. It is anticipated that, except for Building 262 and the structures and some landscaped areas in the Senior Officers' Quarters Historic District, all open spaces on the eastern end of YBI would be required for construction staging. Construction activities on YBI are expected to include soil and rock removal to expand and supplement footings for columns on the island and to install concrete enclosures for the towers at Columns YB2, YB3, and YB4.

Oakland Touchdown Area

No retrofit activities are anticipated in this area because retrofit work was completed for bents east of Bent 22 in March 1998. However, portions of the Oakland Touchdown area may be used for construction staging, equipment storage, and parking for work crews.

In the Bay

Construction in the Bay would take place from barges and/or trestles. Substructure (below bridge deck) activities would consist primarily of expansion of existing footings, pile caps, and columns, which may require removal of some existing material such as concrete. In areas of shallow water at the Oakland Touchdown, cofferdams would need to be constructed to provide work access at each column where foundations are being expanded. Dredging would be required to provide an access channel in shallow water for barges. Dredge quantities for the retrofit alternative are shown on Table 4.14-4. In areas of deeper water, prefabricated pile caps would be used to retrofit the columns.

Tower strengthening would be required to minimize the damage or instability that would occur during a large earthquake and to reduce displacements at the top of the tower to manageable levels. This would be achieved by encasing either whole towers or tower members in concrete. The steel towers at Columns YB2, YB3, and YB4 would be completely encased in concrete; the steel members of the towers at Columns E6 to E8 and E10 to E22 would be encased in concrete.

All foundations, except for that of Column E9, would also be strengthened to reduce and manage the displacement of the foundations.

At Columns YB2 to YB4, cast-in-drilled-hole concrete piles would be used to surround the existing spread footing foundations. The new pile caps would enclose the modified footings.

The existing timber pile foundations from Columns E6 to E16 would be strengthened and stiffened by installing a total of 44 large capacity 1.5-meter (5-foot) diameter cast-in-steel shell pipe piles around each existing column footing. A reinforced and prestressed concrete pile cap would fix the top of the new piles and surround the existing column to strengthen it and connect it to the new piles.

The existing timber pile foundations from Columns E17 to E23 would be strengthened and stiffened by installing a total of 36 large capacity 1.5-meter (5-foot) diameter steel pipe piles at the north and south ends of each existing column footing. A reinforced and prestressed concrete pile cap would fix the top of the new piles and surround the existing column to strengthen it and connect it to the new piles.

In addition, two new columns, E2A and E2B, would be constructed to support the existing cantilever structure (see Figures 2-4.1 and 2-4.2 in Appendix A). The towers for the new columns would be constructed of concrete and would be approximately 30 meters (98 feet) tall. The large diameter steel pipe piles for the new columns would need to be driven deep into the Bay mud to be founded on stable bearing materials.

For Column E2B, the distance to bedrock would be nearly 91 meters (300 feet) below Mean Low Water (MLW). Construction of the new columns would require large-scale construction equipment to drive large-diameter piles, approximately 3 meters (10 feet) in diameter, into stable Bay bottom sediments or rock. Pile drivers would be mounted on deep-draft barges.

It is anticipated that retrofit activities in shallow-water areas near the Oakland Touchdown would be conducted from barges and temporary trestles constructed adjacent to the existing East Span. Dredging would be required to provide barge access in locations where the water depth is shallower than the draft of a barge.

Superstructure

Retrofit of the superstructure would include any construction on or above the lower roadway deck. Isolation bearings would be installed on top of the towers at the connections to the steel truss superstructure. Many of the truss elements adjacent to and above traffic would be strengthened and stiffened. Cross members of the truss would be strengthened or stiffened by adding steel plates, replacing rivets with high-strength steel bolts, and replacing lattice members with solid members or plating them.

A steel space frame (external edge truss) may also be used to strengthen portions of the cantilever section. These frames would extend from the top roadway deck to the lower roadway deck. In addition to the space frame, elements of the cantilever truss at the top would be removed to help isolate each of the cantilever segments from each other.

2.6.2 Bridge Replacement Alternatives

Construction of any of the replacement alternatives would require use of large-scale construction equipment, but because numerous pre-cast materials would be used with a replacement alternative, construction activities would not be as labor-intensive as with the Retrofit Existing Structure Alternative. The replacement alternatives are expected to take five years to complete plus approximately two years to dismantle the existing structure, for a seven-year construction schedule. Traffic would be diverted onto the new structure before the existing bridge is removed. As a result, seismic safety and lifeline criteria would be achieved for westbound traffic four years after the start of construction and, for eastbound travelers, five years after the start of construction.

Possible construction scenarios for a replacement alternative are summarized below. Activities are described for three distinct construction areas: YBI, the Oakland Touchdown area, and in the Bay. Additional information on construction activities, impacts, and avoidance and minimization measures can be found in Section 4.14 — Temporary Impacts During Construction Activities.

Yerba Buena Island

Temporary Construction Easements. The land within the existing easement held by Caltrans on YBI would be insufficient for all of the project's staging and construction area requirements. While the contractor would be responsible for

arranging additional construction space requirements, it is anticipated that all open spaces on the eastern end of YBI would be required for construction staging, except for Building 262 and the structures and some landscaped areas in the Senior Officers' Quarters Historic District. A portion of the northern temporary detour would be built in landscaped areas of the Historic District. The Parade Grounds would be used for temporary administrative offices (trailers), parking, maintenance, equipment and material storage, and related activities.

Arrival of Material and Work Crews. Equipment, materials, and work crews would be transported to YBI either by motor vehicles or by barges. Trucks would use Macalla Road to deliver materials. Materials delivered by truck, during non-peak traffic hours, if feasible, may include cement, reinforcing steel, prestressing steel, structural steel for the temporary detours, falsework material and form lumber. Barges would be used to deliver larger structural segments of the bridge (piles for the tower and structural steel for the tower and main span deck). Cranes situated at locations within the temporary construction easement and/or contractor-leased work areas on the island would be used to lift materials into place. Also, some material trucked to YBI would be loaded onto barges and barged to construction sites along the bridge.

Mobilization/Grading. Grading would occur in the area surrounding the temporary detours and new structures, the Parade Grounds, and hillside areas to provide access for cranes, delivery vehicles, and other construction. Some of the most extensive grading would probably occur where the contractor is creating access to build footings for the temporary detours and the permanent structures. The graded area around the new span would need to be a minimum distance horizontally from the structure to provide adequate vertical clearance for cranes and other equipment.

Soil and rock removal would be required up slope on the island near the tunnel portal in preparation for temporary detour and transition structures, a maintenance garage, a power substation, and construction of footings for columns on the island. Graders, backhoes, loaders, excavators, dump trucks, hoe rams, compactors, survey equipment, sieves, water trucks, concrete trucks, and cranes would be used to complete this task. For the temporary detour footings positioned on hillside areas, sheet pile and/or other temporary shoring may be used to stabilize excavated areas of slope; and cement-modified soil backfill may be used to stabilize the foundations of the transition structure.

Roadway Modifications. Several roadways on YBI would require modifications as a result of construction of the new East Span. Figure 2-20 in Appendix A depicts the existing configurations of the roadways and also shows the modifications to existing roadways (represented by shading). The modifications shown are for Replacement Alternative N-6. The other replacement alternatives would require similar roadway modifications, but the vertical and horizontal changes to the roadways would be slightly different, depending on the bridge alignment.

Macalla Road would be lowered about 1 meter (3 feet) at the intersection of Southgate Road and Macalla Road. The lowered Macalla Road would conform back to the existing grade 75 meters (246 feet) up slope and about 60 meters (197 feet) down

slope. The Macalla Road hairpin at the Southgate Road intersection would be shifted about 5 meters (16 feet) towards the inside of the curve.

Once the eastbound temporary detour is constructed, Southgate Road would be closed to public access for approximately 20 months. As a result, direct access from one side of the bridge to the other, east of the tunnel, would be eliminated during this period. Access from one side of the island to the other side would be via Hillcrest Road and Treasure Island Road. Vehicles traveling to or from San Francisco on the south side of the island would make a U-turn at the Hillcrest Road/Macalla Road intersection.

Before Southgate Road is re-opened, it would be realigned both horizontally and vertically and the lanes would be upgraded to standard width. It is expected that Southgate Road would be shifted approximately 13 meters (43 feet) east at its greatest divergence from the existing alignment, and the roadway would be lowered up to 3 meters (10 feet) from the existing roadway profile for all replacement alternatives. The modification would be made because the existing roadway is located where new columns and abutments would be placed.

In addition, construction of the eastbound temporary detour would require closure of the eastbound off-ramp and the westbound on-ramp on the east side of the YBI tunnel for approximately three years. Access to the SFOBB would continue through the use of the ramps at Hillcrest Road on the west side of the island. The intersection of Treasure Island Road and Southgate Road serves traffic exiting the bridge onto Yerba Buena Island on the east side of the tunnel. A temporary intersection would be constructed south of the existing intersection to serve this traffic and would require a temporary road through an existing slope approximately 35 meters (115 feet) south of Building 206 and Quarters 8.

In consultation with the USCG, the USCG road would be permanently realigned to avoid the columns of the new bridge. For each replacement alternative, the realigned road would be configured differently to avoid different column locations. The section of the USCG road that is roughly parallel to the existing bridge would be shifted south. A new gate and guard shack would be constructed for the realigned road. The access road from the USCG road to the parking lot would be moved from its present location northeast toward the access gate. This temporary access road would be in place for most of the construction period.

A portion of the access road to Building 262 would be modified in two phases (once to avoid the footings of the eastbound temporary detour and, ultimately, to avoid columns of the new bridge). The road would be modified for each replacement alternative but would be configured differently to avoid different column locations. While the eastbound temporary detour is in place, the road would be temporarily realigned approximately 50 meters (164 feet) south of the existing road (see Figure 2-20 in Appendix A). A portion of the access road leading to Building 262 would be permanently realigned approximately 15 meters (49 feet) to the south and would become a two-lane roadway that would conform to the existing single-lane dirt road approximately 115 meters (377 feet) from the eastern end of YBI.

Support Construction. A dock may be constructed on the north side of YBI near the Parade Grounds to facilitate the loading and offloading of material from barges and/or one other temporary barge dock would be constructed under the main span and adjoined to the eastern end of YBI near Building 262. Support facilities such as a maintenance garage and power substation would be constructed.

Construction of Temporary Detours and New Span. A summary of the staging sequence on YBI follows.

- Construction of the new bridge leading up to the eastern end of YBI;
- Construction of eastbound and westbound temporary detours;
- Redirecting westbound traffic onto the new bridge and temporary detour and eastbound traffic from the existing structure onto the temporary detour;
- Removal of the existing bridge from Bent 48 to YBI;
- Construction of the remaining section of the transition structure and eastbound on-ramp;
- Redirecting westbound and eastbound traffic from temporary detours onto new bridge;
- Dismantling the temporary detours and the remainder of the existing bridge; and
- Regrading and replanting vegetation.

The temporary detours would be operational for approximately two years. The period from the beginning of construction to the end of dismantling would be approximately four years. The detours may be removed as soon as they are no longer needed to carry traffic or they may be removed as one of the last steps of bridge construction on YBI, because the contractor may use them as platforms from which to construct other portions of the bridge.

New footings, new columns, and retrofitting and widening the East Viaduct would require drilling, forming, excavation, backfilling, driving piles or tie-downs, erecting steel, placing reinforcing steel, placing concrete, and constructing concrete forms. The majority of excavation would be conducted to provide access to construct the footings. Falsework would be constructed underneath the cast-in-place-concrete structures until those structures are self-supporting. Concrete might be mixed at a batch plant located either on the island or remotely. Trucks would deliver concrete to the site, and it would be poured or pumped into place. Cranes would be used for steel erection, lifting forms, placing reinforcing steel, and raising materials and equipment to locations on top of the structure.

For construction of Column W2 with a northern alternative, substantial excavation and bedrock removal would be necessary to reach the elevation of the footing. The exterior of the column would be concrete, and the interior of the column would consist of four pre-cast shell tubular units that would be filled with concrete. The tubular units would arrive on a barge via Clipper Cove and be lifted into place by crane. The bent cap atop this tubular unit would be a cast-in-place concrete box girder.

The columns for the transition structures would be cast-in-place concrete, and the deck would be a cast-in-place post-tensioned box girder. Pile drivers would be used to drive the steel H-piles that would be used for most of the footings.

Oakland Touchdown

Temporary Construction Easements. As is the case on YBI, the right-of-way available for staging operations would not be sufficient for constructing the new structure. Land adjacent to the Caltrans right-of-way on the south side of the existing roadway would likely be required for construction staging. While the amount of area has yet to be determined, it is likely the construction yard/easement would occupy 1-4 hectares (2.5-10 acres).

Arrival of Material and Work Crews. Access to the site would most likely be from I-80 and surface streets south of I-80, such as Burma Road. As the bridge is being built westward, the contractor may build a trestle out to the first skyway column for the delivery of materials, equipment, and work crews.

Roadway Modifications. The existing Caltrans maintenance road has been redesigned and would cross under the eastbound roadway at a point east of the existing undercrossing. This location was selected to minimize the amount and impact of fill in the Bay and yet provide enough overhead clearance for vehicles to cross under the eastbound roadway (see Figure 2-25 in Appendix A).

Construction of Temporary Detours and New Span. As the new eastbound approach and bridge structures are completed for all replacement alternatives, traffic would be re-routed from the existing structure to the new structure through the use of a temporary roadway (see Figure 2-25 in Appendix A and Section 2.6.4 — Temporary Detours on Yerba Buena Island and Oakland Touchdown Area for more detail).

Construction activities for all replacement alternatives in the Oakland Touchdown area would primarily consist of paving, traffic maintenance, excavation of buried rubble, riprap and footings, drilling, settlement control measures, removal of some existing roadways, construction of temporary access trestles, and dredging in shallow water to provide barge access to the shoreline of the western edge of the Oakland Touchdown area.

Pile driving and placement of footings in the water adjacent to the Oakland shoreline would be required to build new bridge structures. This would require the use of equipment from land, trestle, and/or barge as described above. For Replacement Alternatives N-2 and N-6, the structures would encroach into existing sand flats and eelgrass beds and land-based roadways would be constructed on imported engineered fill. For all replacement alternatives, excavation of the area would occur for the construction of footings and pile driving and would include removal of buried fill or riprap that extends east from the westbound abutment. A riprap shoreline, replacing the existing riprap, may be constructed along the edge of the new alignment near the existing shoreline where the bridge elevation is approximately 5 meters (16 feet) above MSL.

There is the potential for soil settlement in the Oakland Touchdown area because the soil/fill is underlain by soft materials. For Replacement Alternatives N-2 and N-6, wick drains and a surcharge would be used to accelerate the consolidation process of the new embankment fill, some of which would be cellular concrete. Other design considerations such as compaction may also be used to reduce the risk of unacceptable settlement. Any permanent fill placed, except for cellular concrete, would be compacted to Caltrans specifications.

For Replacement Alternatives N-2 and N-6, a portion of the westbound lanes to the east of the bridge abutment would encroach on the Bay, requiring use of engineered fill. A portion of the Caltrans maintenance road located to the west of the bridge abutment would also require use of engineered fill.

In the Bay

Arrival of Material and Work Crews. Employee and equipment access would be by boat, barge, the replacement bridge, or temporary trestle. Vessels used for delivery of workers, equipment, and materials should be able to moor at the end of the temporary docks at YBI or on trestles at the Oakland Touchdown area.

General Construction Information. Most in-water construction would take place from barges or from the decks of the skyway as it is being built outward into the Bay. Barges would be used for material delivery, dredging, drilling, pile driving, lifting, possibly concrete batch plants, and dismantling. Special barges and lifting equipment would be used to accommodate heavy equipment needed to support large-scale pile driving. In areas of shallow water, trestles could be used in conjunction with barges. It is expected that the trestles, if used, would provide five working platforms (approximately 12 meters [39 feet] in width) around columns near the Oakland Touchdown to support lighter equipment.

Dredging. Dredging would be required for portions of the Retrofit Existing Structure Alternative and each replacement alternative for barge access, foundation construction, and pile cap construction because near the Oakland shore the water depths are shallower than the draft of a standard barge. The proposed access channel for barges would be on the north side of the northern alternatives and the south side of the southern alternative. The anticipated maximum draft for the barges is 3 meters (10 feet), but to ensure adequate clearance over potential irregularities in channel depth, barge ""listing during heavy lifting, and to allow for some potential resettlement of materials in the channel after dredging, the channels would be dredged to a depth of 3.6 meters (12 feet) adjacent to the Oakland Touchdown and 4.3 meters (14 feet) for the rest of the channel. Dredging to a depth of 4.3 meters (14 feet) would also be required northeast of the USCG facility on YBI for Replacement Alternative S-4. Barge anchor lines would be moved into position from smaller boats as opposed to the primary barge(s) to prevent the dragging of anchors into position, and barge anchor lines would be kept taut as the tide and levels change in order to minimize contact between the lines and the Bay bottom.

Section 4.14.10 — Temporary Impacts, Construction Excavation, and Dredging discusses dredging and options for disposal of dredged materials in more detail.

Estimated dredged quantities for the build alternatives are presented in Table 4.14-4. Figures 2-21 and 2-22 (in Appendix A) illustrate the potential barge access channel configurations denoted by the dredging limits at the Oakland Touchdown and YBI.

Structure Construction. The substructure (below the tops of the columns) would consist of columns, foundations, piles, pile caps, anchoring systems, fenders, navigation electrical systems, and possibly a corrosion monitoring system. Substructure construction would consist primarily of installation of columns, piles, and pile caps. It is expected that cofferdams would be constructed to build columns in shallow water near the Oakland Touchdown, and cast-in-steel shell piles would be driven to serve as the foundation to the permanent columns. Where piles are driven, mud within the piles would be removed and replaced with concrete placed by pump. The removed mud would be beneficially reused or disposed of off-site. Construction of columns adjacent to YBI, including the main span tower, would require Bay bottom rock removal to secure the tower foundation. Excavation would occur to remove loose rock, which would be disposed of off-site at an upland location. Shafts would then be drilled through the bedrock down to and into the load-bearing strata and piles would be driven into the shafts. Construction of the main span tower and columns would require large-scale construction equipment, including cranes, barges, dredges, drill rigs, concrete batchers, and concrete pumps. Pile drivers and drills would be mounted on deep-draft barges to drive large-diameter piles as required.

The superstructure (the portion of the bridge above the top of the columns) would be primarily constructed of steel and concrete and would consist of girders, cable elements, the deck, deck joints, barriers, bearings, lighting, and signing. Many of these items would be pre-cast or fabricated off-site then transported to the site and lifted from barges using floating and tower cranes. For a portion of the main span, the superstructure would be delivered to YBI, set on the shore and lifted with land cranes. Barge-mounted concrete batch plants may also be used to pump concrete into forms suspended over water for the bridge deck at both the east and west ends of the project. A temporary structure would be built from YBI east into the Bay to support the main span while the permanent bridge deck and main tower are constructed. Temporary columns may be placed in the Bay or on either side of the permanent main tower. Temporary trestles may be constructed from the Oakland Touchdown westward.

Once portions of the new structure are constructed, they could be used as working platforms for other construction activities. Construction activities taking place from the new structure could include delivery of materials and equipment and lifting and positioning of structural components.

For construction of the main tower, Bay bottom sediments would be removed, holes would be drilled into bedrock, and hollow steel piles would be driven or socketed into the holes. A prefabricated steel box pile cap would be floated into position and sunk onto them, sealed around the piles, and pumped dry. The pipe piles and pile cap would be filled with reinforced concrete and steel creating a surface on which four prefabricated tower legs would be erected. The legs would be raised by cranes and bolted together by link beams.

For the main span, prefabricated steel deck segments would be transported to the site by barges, raised by crane, and placed on falsework. Each newly elevated segment would be slid forward on the falsework and connected to the previously installed segment. After the cables and suspenders are anchored to the deck, the falsework would be removed and utilities would be installed.

Construction of the skyway piles would be similar to that of the main tower. The piles would be driven into the Young Bay Mud, a prefabricated steel box pile cap would be floated into position and sunk onto the piles, sealed around them, and then pumped dry. Precast concrete fenders would be brought to the site and attached to the pile cap. The pipe piles and then the pile cap would be filled with reinforced concrete, creating a surface on which the columns can be founded.

Bridge Closures. Caltrans is continuing to investigate lane and bridge closures to transition traffic from the existing bridge to the temporary detours and to a replacement bridge. Caltrans would plan the closures in an effort to simultaneously minimize public inconvenience, facilitate construction, and maximize public safety. The closures would be scheduled to occur during off-peak hours to the maximum extent feasible. Caltrans would implement a Traffic Management Plan to manage impacts to traffic.

2.6.3 Dismantling the Existing SFOBB East Span

Dismantling the existing SFOBB East Span would be required to provide land connections to the new span for replacement alternatives at YBI and the Oakland Touchdown area. USCG also requires removal of the entire existing bridge for the safety of marine traffic once a replacement bridge is constructed. The Coast Guard Bridge Administration Manual, Commandant Instruction M16590.5A, requires "that any part of bridges which are replaced (except those parts incorporated into the new bridge) be removed down to the natural bottom of the waterway..." (See U.S. Coast Guard [USCG] letter dated August 12, 1998, in Appendix G.) The USCG currently plans to require that existing bridge piers and temporary pier piles be removed to an elevation of at least 0.46 meter (1.5 feet) below the mudline, to be measured at the time of removal.

The existing bridge, access trestles, temporary falsework, and temporary detours would be removed under the replacement alternatives. The methods of removal selected by the contractor would comply with all dismantling guidelines of the following required permits: Section 401 of the Clean Water Act, a National Pollutant Discharge Elimination System (NPDES) permit, an ACOE permit pursuant to Section 10 of the Rivers and Harbors Act; a USCG permit pursuant to the General Bridge Act of 1946 and a Bay Conservation and Development Commission (BCDC) Major Permit.

Removal would be conducted in such a manner that the portion of the structure not yet removed remains in a stable condition at all times.

There are two primary physical constraints affecting the dismantling task. First is the proximity of the replacement alternatives to the existing spans, which would necessitate

performing most marine activities from one side. Second, the shallow water depths beneath the spans as they approach the Oakland Touchdown area would require using shallow-draft barges or dredging along one side and underneath for deeper draft barge access.

Dismantling activities would consist of seven major stages, which represent major components of the bridge (see Figure 2-15 in Appendix A):

- YBI Viaduct;
- YBI 88-meter (288-foot) steel truss approach spans;
- Oakland shore;
- YBI temporary detours;
- Cantilever truss spans;
- 155-meter (509-foot) steel truss spans; and
- 88-meter (288-foot) steel truss spans.

The YBI viaduct, the YBI shallow truss approach spans, the Oakland shore section, and the YBI temporary detours would be dismantled during construction of a replacement alternative because of construction staging. The three other sections would be dismantled under separate contracts.

Dredging. Some areas near the Oakland Touchdown are too shallow to accommodate the large barges needed to complete the dismantling process; thus, an access channel would need to be dredged. Once the superstructure is removed, the bridge foundations would be removed to an elevation of at least 0.46 meter (1.5 feet) below the mudline. This would require the excavation of sediments around the footings using cofferdams and techniques such as reverse circulation drilling, jetting, and air lifting to remove the material around the footings. These methods involve creating a slurry of material within the cofferdam and lifting or pumping it into the drilling vessel or barge. The material may also be removed by mechanical clamshell excavation; however, dustpans and sidecasters would not be permitted. Access dredging for dismantling and sediment reuse/disposal options are described in Section 4.14.10 — Temporary Impacts, Construction Excavation, and Dredging and the Dredged Materials Management Plan (DMMP) (see Appendix M).

Superstructure

Removal of deck structures could be performed by cutting them into pieces or by disassembling them panel by panel. Steel truss spans over the water near the Oakland shore cannot be removed by conventional barge and crane methods due to the shallow water and low clearance under the deck. A possible option is to construct temporary supports under the span and disassemble the truss segment by segment. Other possible methods to remove the steel trusses include dredging for barge clearance, constructing access embankments of temporary engineered fill, or using special shallow-draft barges or rigging devices for lowering sections onto barges from the bridge deck. Protective measures would be taken to prevent materials or debris from falling into the Bay. Depending on location, materials could be removed by barge or truck to a predetermined site for reuse, recycling, or disposal. Depending on methods used by the contractor, the temporary detours on YBI (described in Section

2.6.4 — Temporary Detours on Yerba Buena Island and Oakland Touchdown Area) could be designed for simple erection and disassembly with relatively light equipment. Access dredging for dismantling and sediment reuse/disposal options are described in the DMMP (see Appendix M).

Substructure

Large structural elements could be lifted from their bases in one piece or piece by piece. Dismantling of the concrete foundations at the columns would require reducing the reinforced concrete to pieces that are small enough to be hauled away. This could be done by mechanical means such as saw cutting, flame cutting, mechanical splitting, or pulverizing and hydro-cutting. According to ACOE and BCDC, another acceptable method of disposal would be to use the hollow interiors of the columns remaining below the mudline as receptacles for pieces of concrete. As the upper portion of the column is dismantled, pieces of concrete could fall into the hollow interiors below the mudline. When the portion of the column above the mudline is completely removed, the column remaining below the mudline could be capped or would gradually fill in through siltation. Removal of the columns to 0.46 meter (1.5 feet) below the mudline could be done by an underwater dismantling method or by constructing cofferdams at each column. The cofferdam method includes construction of a cofferdam around the column, pumping the water out, and removal of concrete with jackhammers, concrete saws, drills, corers, and cranes to lift the debris out. Depending on methods used by the contractor, cofferdams may or may not be used for columns adjacent to YBI and the Oakland Touchdown. Use of cofferdams is assumed for purposes of estimating dredge disposal quantities generated by existing bridge removal (see Table 4.14-4). Any reinforcing steel would be cut off to remain flush with the face of the concrete that remains below the mudline.

2.6.4 Temporary Detours on Yerba Buena Island and Oakland Touchdown Area

Temporary detours are designed to reroute traffic around the existing structure on YBI and at the Oakland Touchdown area.

Several temporary detour options were considered for YBI and evaluated based on construction feasibility, impacts to YBI resources, construction schedule impacts, traveler and worker safety, and traffic operational impacts. It was determined that the preferred option for temporary detours would be a north-south detour option. This option is discussed below. Other options considered and withdrawn are presented in Section 2.7.10 — Temporary Detours.

Yerba Buena Island

On YBI, the temporary detours would route traffic around the construction area while portions of the existing East Span are demolished and new transition structures are completed where the existing bridge now stands. The temporary detours would allow the replacement structures to be connected to the retrofitted YBI East Viaduct while minimizing impacts to traffic.

Replacement Alternatives N-2 and N-6, North-South Temporary Detour Options. Replacement Alternatives N-2 and N-6 temporary detour options are located entirely on land and range in length from 480 meters (1,574 feet) to 580 meters (1,902 feet).

The westbound temporary detour would be constructed north of the YBI transition structure and existing East Span. Westbound traffic would be routed from the new westbound bridge structure onto the temporary detour, to the existing viaduct, then to the existing YBI tunnel. The eastbound temporary detour would be constructed south of the transition structure and existing bridge (see Figures 2-16.2 and 2-17.2 in Appendix A). Eastbound traffic would exit the tunnel onto the eastbound temporary detour and connect to the lower deck of the modified existing bridge which would continue to carry eastbound traffic during construction. In order to allow for eastbound traffic to travel from under the existing westbound (upper) deck, a cast-in-place concrete portal frame would be constructed to support the south edge of the westbound deck. When the load is being transferred from the support columns to the portal frame, the eastbound and westbound traffic lanes would be fully closed, allowing for removal of the columns.

Replacement Alternative S-4 North-South Temporary Detour Option. Replacement Alternative S-4 temporary detour would range in length from 400 meters (1,312 feet) to 450 meters (1,476 feet).

Replacement Alternative S-4, north-south temporary detour, would require placing three temporary columns immediately offshore from YBI. The westbound temporary detour would be constructed north of the transition structure and existing bridge. Westbound traffic would be routed from the existing viaduct to the temporary detour, then back onto the existing East Span before the tunnel. The eastbound structure would be placed south of the transition structure and existing East Span (see Figure 2-18 in Appendix A). Eastbound traffic would exit the tunnel, transfer to the eastbound temporary detour, and connect to the new eastbound bridge.

Oakland Touchdown Area

Temporary detours would be built on engineered fill on existing land. Temporary construction easements would be required where the temporary detour limits extend beyond the existing rights-of-way.

Temporary detour roadways at the Oakland Touchdown area would be similar for the northern replacement alternatives. The eastbound temporary detour roadway would be constructed to the south of the existing eastbound lanes, requiring relocation of the existing Caltrans maintenance road and use of Port of Oakland land. Temporary roadways would not be required for construction of the westbound approach and structures. Construction sequencing would begin with the construction of the westbound approach roadway and rerouting westbound traffic from the existing westbound approach onto the new westbound structure. Following construction of the eastbound approach and structure, eastbound traffic would shift from the temporary detour onto the new structure, and the Caltrans maintenance road would be realigned.

Under Replacement Alternative S-4, traffic would remain on the existing East Span until completion of the new westbound and eastbound structures. Once the eastbound structure is completed, eastbound traffic would be diverted from the existing bridge to the new eastbound structure and onto a temporary detour roadway on existing Port of Oakland land south of the proposed structure. Westbound traffic would remain on the existing structure until construction is completed for the westbound structure and approach. On completion of the westbound bridge approaches, roughly between stations 87 and 89 on Figures 2-11.4 and 2-11.5 (Appendix A), westbound traffic would be diverted to the new westbound structure.

2.7 ALTERNATIVES CONSIDERED AND WITHDRAWN

In addition to the alternatives and project features described above, Caltrans considered a range of other project alternatives and features prior to the DEIS which were ultimately withdrawn from further consideration for a variety of reasons. These alternatives (shown on Figure 2-19 in Appendix A) and features are described below, along with the reasons for their withdrawal.

2.7.1 Replacement Alternative N-1

Replacement Alternative N-1 is a 3,685-meter (12,087-foot) long replacement alignment located to the north of Replacement Alternative N-6. Eastward from the YBI tunnel, this alternative would transition from a double-deck viaduct to two parallel structures. The alternative meets project design criteria and accommodates a main span cable-stayed, self-anchored suspension, or skyway design option. A bicycle/pedestrian path could be constructed as part of Replacement Alternative N-1. At the transition structure over YBI, the bridge would split from a double-deck structure to two parallel single-deck structures.

Replacement Alternative N-1 was defined, in part, to respond to recommendations from the MTC EDAP calling for an alternative that arched northward to maximize San Francisco skyline views for westbound bridge users and panoramic East Bay Hills and Oakland skyline views for eastbound users.

Replacement Alternative N-1 was defined as the northernmost alignment capable of providing skyline views while minimizing intrusion into Bay bottom geologic zones associated with the ancient Temescal Creek bed. This geologic zone contains deep mud layers. However, based on geologic data obtained after setting the alignment for Replacement Alternative N-1, it was determined that approximately one-half of it would fall within areas of deep Young Bay Mud, increasing the complexity, schedule, and cost of constructing the bridge substructure.

Although Replacement Alternative N-1 could be designed to maintain a lifeline vehicular connection in the event of an MCE, construction of the alternative would increase construction schedule and cost without providing substantially enhanced panoramic views when compared to other northern alternatives. Replacement Alternative N-1 was withdrawn from further consideration, and additional northern

alternatives were analyzed for their ability to maximize user views while avoiding undesirable Bay bottom geologic zones.

2.7.2 Replacement Alternative N-3

This alternative, along with Replacement Alternatives N-4 and N-5, was defined through further refinements of northern alternatives. Studies were directed to meeting operational and safety design standards to the greatest extent possible, while placing the tower for the cable-stayed or self-anchored suspension design variations close to YBI, where geologic conditions are most favorable for the positioning of the tower footing that would, in turn, allow the main span to be positioned over the main navigation opening.

Replacement Alternative N-3 would place the main span tower approximately 110 meters (360 feet) offshore from YBI where distance to rock is approximately 20 meters (65 feet) with limited overlay of Young Bay Mud. Location of the tower at this site would facilitate construction schedule by reducing the amount of Bay excavation required.

Although tower placement would be optimized under Replacement Alternative N-3, the tower location would require the roadway horizontal and vertical alignments to be modified to less than optimum configurations, resulting in restricted sight distances which would affect driver response and, ultimately, roadway safety. The distance between the east YBI tunnel portal and the tower would require the westbound alignment to begin a northward curve immediately upon exiting the tunnel, resulting in restricted sight distance for westbound drivers approaching the tunnel portal. Roadway superelevation, the angle of tilt on a horizontal curve, would be limited to one percent. These design conditions would not meet American Association of State Highway and Transportation Officials (AASHTO) current design standards, requiring application for a mandatory design exception. A design exception would also be required because the westbound on-ramp from YBI would have inadequate sight distance. Replacement Alternative N-3 would also require using asphalt to build the height of the lanes on the upper deck of the YBI East Viaduct to connect to the new structure. Based on the inability of the Replacement Alternative N-3 to meet operational and safety design standards to the same extent as alternatives carried forward, it was withdrawn from further consideration.

2.7.3 Replacement Alternative N-4

Replacement Alternative N-4 was identified through refinement of northern alternatives. Replacement Alternative N-4 would place the main span tower 120 meters (394 feet) from YBI in the main navigation opening. The alignment would be south of Replacement Alternative N-1, minimizing intrusion into undesirable Bay bottom geologic zones.

Replacement Alternative N-4 was a modification of Replacement Alternative N-3 which provided for a 180-meter (591-foot) tangent (straight) roadway section at the YBI tunnel approach on the westbound alignment. This alternative was defined to prevent westbound traffic entering the tunnel portal on a curve. Replacement Alternative N-4

would meet the minimum roadway geometric operational and safety design standards. Overlay of the existing YBI East Viaduct upper deck roadway would be required to conform with the new westbound structure.

Although Replacement Alternative N-4 met minimal operational and safety design standards, geometric requirements would push the main span tower location further into the main navigation opening where distance to rock and depth of Young Bay Mud increased significantly compared to Replacement Alternative N-3. The increased depth to the main span tower would increase project cost and extend the construction schedule. Based on the deep water tower location, Replacement Alternative N-4 was withdrawn from further consideration, and alternative refinement studies were advanced.

2.7.4 Replacement Alternative N-5

Replacement Alternative N-5 represented a continuation of northern alternative refinement studies. Replacement Alternative N-5 would place the main span tower 158 meters (518 feet) offshore from YBI. Compared to the alignments for Replacement Alternatives N-3 and N-4, Replacement Alternative N-5 consisted of a 6,000-meter (19,685-foot) radius curve on the westbound alignment. As with Replacement Alternative N-3, the westbound alignment would enter the YBI tunnel portal on a curve, although the large curve radius would reduce or eliminate sight-distance concerns associated with Replacement Alternative N-3. Replacement Alternative N-5 would increase the rate of superelevation to two percent, which meets minimum design standards. Elevating the deck of the existing YBI East Viaduct would be required to conform to the new westbound structure.

Based on the desire to place a tangent roadway section at the westbound alignment approach to the YBI tunnel portal and the need to place and maintain the main span tower as close to YBI as possible, Replacement Alternative N-5 was withdrawn from consideration in favor of Replacement Alternative N-6.

2.7.5 Replacement Alternative S-1

Replacement Alternative S-1 was developed to minimize the length of the new bridge by providing a tangent directed toward the Oakland shore. As such, it would enter and exit the YBI East Viaduct similar to the existing alignment, eliminating the alignment curves that would provide panoramic vistas of the East Bay hills and the San Francisco skyline. The length of the bridge would be 3,525 meters (11,562 feet).

Replacement Alternative S-1 and other southern alternatives were proposed to reduce impacts to redevelopment concepts planned on YBI by the City and County of San Francisco (CCSF). Draft land use redevelopment scenarios would be affected by all replacement alternatives; however, southern replacement alternatives would use areas of YBI with more limited redevelopment potential for CCSF.

Replacement Alternative S-1 would align the replacement structure parallel and to the south of the existing East Span. This alternative would affect the East Bay Municipal

Utility District (EBMUD) sewer outfall that is aligned south of the existing SFOBB. The outfall is approximately 85 meters (280 feet) south of the existing bridge at its eastern end and 219 meters (720 feet) to the south at its western end (see Figure 2-19 in Appendix A). The offshore portion of the pipeline is approximately 1,600 meters (1 mile) long. This 2.44-meter (8-foot) diameter outfall pipe disperses treated effluent from the EBMUD main wastewater treatment facility located immediately to the east of the project area. The outfall and a dechlorination facility located on the Oakland Touchdown area are critical elements to the operation of the EBMUD main wastewater treatment plant.

EBMUD reviewed proposed Replacement Alternative S-1 and expressed concern that the construction of the replacement bridge structures and the transverse crossing of the outfall in the Bay could cause both short- and long-term damage to the facility and increase complexity of maintenance activities. The outfall facility is 50 years old and construction activities, such as pile driving and dredging, may affect the structural integrity of the pipeline. The outfall would be at risk of damage or ruptures that could cause the release of secondarily treated effluent into the Bay. If this were to occur, EBMUD could be held in violation of its National Pollutant Discharge Elimination System (NPDES) Permit and could incur substantial monetary fines levied by the San Francisco Regional Water Quality Control Board (RWQCB). As a result, EBMUD determined that relocation of the outfall and dechlorination facility would be required to avoid potential conflicts or incidents.

In response to consultation with EBMUD, Replacement Alternative S-1 was revisited. By reducing the horizontal curve radius of the structures adjacent to YBI, Replacement Alternative S-1 was modified to more closely parallel the existing East Span at the approach to the Oakland Touchdown area. The revisited Replacement Alternative S-1 would eliminate a transverse, crossing in the Bay of the EBMUD outfall structure by setting the alignment between the existing East Span and the outfall pipe. Although no direct alignment conflict with the outfall structure would occur, concern remained for construction-period impacts to the outfall. The potential for damage to the outfall during construction could involve additional environmental permitting, thereby causing schedule delays, and during a seismic event, potential for damage to the outfall and bridge structures would be increased due to the proximity of them. Further investigation revealed that proposed replacement bridge construction methods would require dredging for barge access that could not be accomplished within the area between the existing bridge and the outfall structure.

Based on the potential conflicts with the EBMUD sewer outfall, Replacement Alternative S-1 and revisited Replacement Alternative S-1 were withdrawn from consideration in the DEIS in favor of a southern alternative that minimized potential conflict with the outfall structure.

The City and County of San Francisco Modified S-1 Alternative

In a comment letter on the DEIS (see the City and County of San Francisco Planning Department letter dated November 23, 1998 in Volume II of this FEIS), the CCSF presented a southern alternative (referred to in this FEIS as the CCSF Modified S-1 Alternative). Under this alternative, the new bridge would be located south of the

existing structure and designed to minimize bridge length between YBI and Oakland (like the previously withdrawn Replacement Alternative S-1). The CCSF Modified S-1 Alternative would consist of two parallel structures similar to those proposed for the replacement alternatives. This 3,450-meter (11,320-foot) long structure would provide a straight connection from YBI to Oakland, moving away from the TI/YBI developable land to the north with a single curve for each roadway at YBI.

The columns supporting the eastbound roadway where it crosses the EBMUD outfall pipe would straddle the structure with outrigger "frame" supports and provide an opening through the foundation pilings for the outfall pipe.

Further Study of Relocating or Straddling the Outfall

Since publication of the DEIS, relocation and straddling options for the outfall were further evaluated to determine the feasibility of the CCSF Modified S-1 Alternative. Because this alternative was withdrawn from consideration prior to the circulation of the DEIS, a supplemental DEIS was not warranted for this additional analysis. At the request of FHWA and the Navy, ACOE examined the feasibility of the CCSF Modified S-1 Alternative. ACOE reviewed reports, backup data, and analyses provided by Caltrans, CCSF, consultants, and EBMUD to provide an independent assessment of the risks, costs, complications, and schedule issues associated with constructing the bridge along the CCSF Modified S-1 Alternative alignment. In January 2000, ACOE compiled the results of its review in a report entitled "Assessment of the San Francisco-Oakland Bay Bridge Seismic Replacement Project's Impact on the EBMUD Sewer Outfall."

Options. In addition to an option where bridge foundations are designed to straddle the outfall pipe, three outfall relocation options were examined: trench relocation, use of a tunnel, and partial relocation.

The trench relocation option would relocate the entire sewer outfall to the north with a crossover pipe connected to the onshore pipeline. For the pipe to be founded in dense sands, the bottom of the offshore pipe would have to be located at approximately 20 meters (66 feet) below MSL. In areas where the sand layer is deeper, sub-excavation of the soft sediments would have to be done to as deep as 25 meters (82 feet) below MSL and backfilled.

A tunnel option would also relocate the entire outfall to the north of its current position. This option was evaluated because relocating the outfall to the north of the alignment reduced the potential for damage to the outfall during construction or a seismic event. As a result, there were fewer issues to address in the environmental documentation and permitting processes, which would prevent schedule delays. In addition, the tunnel option could increase the design life of the outfall to over 100 years because the tunnel would be located within the stiff clay/dense sand layer below Young Bay Mud at approximately 30 meters (98 feet) below MSL. This location would also reduce the potential for damage to the bridge resulting from a shift of the outfall during a seismic event.

The partial relocation option, which was developed to minimize impacts from Replacement Alternative S-4, includes relocating a portion of the onshore pipeline. Under this option, the alignment would avoid the offshore portion of the pipeline, but would cross over the onshore portion of the pipeline just east of the dechlorination facility. This crossing may create the possibility for damage to the outfall during construction activities. The dechlorination facility would not be displaced. The CCSF Modified S-1 Alternative would cause the entire offshore sewer pipeline to be relocated to avoid major impacts to the design and construction of the bridge. The partial relocation option would not be applicable to the CCSF Modified S-1 Alternative because it would result in the relocation of the entire offshore portion of the outfall.

Costs. Straddling the outfall would require significant modifications to the structural and foundation design of the new bridge, special and costly pipeline protective measures, and innovative foundation installation. Due to numerous uncertainties in regard to these issues, the cost of the straddling option is difficult to estimate without conducting a detailed design study.

Based solely on existing estimates of construction costs, the tunnel option would cost $87 million, the trench relocation option would cost $72 million, and the partial relocation option would cost $17 million. In addition to the construction costs, other incremental costs range from $43 to $77 million and are identified below.

It is estimated that additional study costs would range from $1.8 to $3.8 million and include land and marine outfall surveys, geotechnical studies of outfall foundation, bedding material, and surrounding geology, seismic analysis to model interaction between outfall and the new bridge foundation, and condition assessment for the outfall before and after construction. Additional design and construction costs are estimated to range from $19.0 to $36.5 million. Secondary construction costs (e.g., cost of implementing a monitoring program, demolishing the Key Pier Substation, and relocating the maintenance access road) range from $17.1 to $28.2 million. Post-construction costs range from $5.5 to $8.3 million and include a post-construction condition assessment of the outfall and future operations and maintenance costs. The ACOE, at the conclusion of the independent review of the outfall crossing report, stated that construction costs would likely constitute nearly half of the incremental costs, but it is difficult to verify the magnitude of these costs because the highest itemized cost estimate reflects restrictions related to seasonal breeding and migration of wildlife that may not materialize. The ACOE, in summarizing its independent review, stated that a more defensible overall estimate was $35 to $70 million. Costs for possible outfall damage range from $14.5 to $24 million and include increased risk associated with handling and placement of piles, construction and columns of superstructure, construction of trestles, and access dredging.

These incremental costs do not include possible costs arising from daily fines for any National Pollutant Discharge Elimination System (NPDES) permit violations.

Advantages/Disadvantages. The straddling option would involve several construction challenges and future access to the outfall for maintenance and repairs

would be more difficult due to the close proximity of new bridge columns and abutments.

Each of the outfall relocation options has distinct advantages and disadvantages when compared to the others.

Costs would strongly favor the partial relocation option, but this could only be implemented with Replacement Alternative S-4.

The trench relocation option's advantages are a new offshore pipeline and a location for the outfall that would be clear of SFOBB southern alternatives. This is EBMUD's preferred option. The disadvantages are higher costs, greater disruption to sensitive San Francisco Bay waters, and delays in project schedule of 3-5 years. These delays, which would also apply to the tunnel option, would result from preparation of a design, completion of the environmental review process, acquiring permits as necessary from BCDC, ACOE, National Marine Fisheries Service (NMFS), California Department of Fish and Game (CDFG), U.S. Fish and Wildlife Service (USFWS), and RWQCB, building the new outfall, and removing the existing outfall.

The tunnel option advantages are also a new offshore pipeline, a design life that is at least twice as long as the trench relocation option due to greater protection of the pipeline from seismic events and offshore hazards, fewer impacts to the Bay environment, and fewer schedule extensions due to reduced permitting. The disadvantages are higher costs, restricted access for maintenance of the pipe, and the delays of 3-5 years mentioned above.

Further schedule delays for all relocation options are likely to occur as a result of the negotiation process with EBMUD, which has requested indemnification in perpetuity. It is difficult to quantify how long negotiations would take. Also, if the integrity of the outfall becomes compromised during construction, it is likely that there may be construction delays while response measures are developed and implemented. Actual damage to the outfall leading to a violation of the NPDES permit may result in a shutdown of the entire bridge construction project while repairs take place.

The environmental review process mentioned above would involve production of a supplemental Environmental Impact Statement (SEIS) for all options to assess the likelihood of damage to the outfall during or after construction. The SEIS would be used to develop the appropriate response measures for potential sewage spills caused by outfall blockage and a resulting treatment plant failure.

Other Issues Related to a S-1 Alternative

In addition to the impacts to the EBMUD outfall, there are several other issues associated with the CCSF Modified S-1 Alternative.

Section 4(f) Use. The Oakland Army Base Reuse Authority (OBRA) Reuse Plan has designated 5.9 hectares (14.7 acres) at the westernmost portion of the former Army Base on the Oakland Touchdown as the site of a proposed public access shoreline park. The proposed Gateway Park has received the support of interested local,

regional, state, and federal agencies. The EBRPD has taken the responsibility for being the lead agency to further plan and manage the park. The Gateway Park is a Section 4(f) resource pursuant to the Transportation Act of 1966 and, as such, receives protections from use by transportation projects.

The CCSF Modified S-1 Alternative would bisect the parcel of designated parkland and would reduce the size of the proposed park by approximately one-half. This alternative would use much of the westernmost end of the park property, where views of the Bay to the south and west are the most dramatic and where the presence of a park would most effectively enhance the experience of landfall for bridge users and for park visitors. The bridge structure would also be immediately adjacent to the remaining parkland, thereby increasing expected noise levels in the park. A southern alternative would result in a Section 4(f) use of the proposed park.

Besides using a Section 4(f) protected parkland, the CCSF Modified S-1 Alternative would cross directly above the historic Key Pier Substation, which is also protected by the provisions of Section 4(f). The alignment would either span the building or would require its dismantling. Dismantling would constitute a Section 4(f) use.

Main Span Tower Construction Complexity. Founding the main span tower in bedrock would be more cost and time efficient than founding it in Young Bay Mud. The tower for all southern alternatives would have to be constructed approximately 67 to 71 meters (220 to 233 feet) below the mudline to be founded on bedrock. As a comparison, under Replacement Alternative N-6, the distance to the bedrock ridge is 6 to 9 meters (20 to 30 feet) below the mudline, and under Replacement Alternative N-2, the distance to bedrock is 11 to 14 meters (36 to 46 feet) below the mudline. Underwater construction increases in difficulty and cost with greater water depth. Safety requirements are also substantially increased, which could affect project schedule and cost. Depending on maximum construction depths, specialized equipment may be needed.

Visual/Aesthetics. Aesthetically, a northern alternative provides for a greater range of views for bridge users. Southern alternatives do not provide panoramic vistas of the East Bay hills and the San Francisco skyline to the extent that the northern alternatives do.

Conclusion

Replacement Alternative S-1, revisited Replacement Alternative S-1, and the CCSF Modified S-1 Alternative were withdrawn from consideration because construction of other southern alternatives that do not conflict with the EBMUD outfall are less likely to cause schedule delays (an estimated 8-15 months minimum), cost increases in the millions of dollars, increased risk of environmental damage resulting from effluent release, and complexity of long-term maintenance.

2.7.6 Replacement Alternative S-2

Replacement Alternative S-2 represents a continuation of southern alternative studies. Replacement Alternative S-2 provided broader radius curves at the YBI transition

areas, avoiding the need for design exceptions. In response to geometric constraints, the distance to rock suitable for tower footings would also be in excess of 61 meters (200 feet) below the mudline.

Construction staging to maintain five lanes of traffic in each direction would require construction of temporary detours eastward to the cantilever section of the existing East Span. Further investigation indicated that tie-in of the temporary detours to the cantilever section would be complex and could potentially compromise the structural integrity of the existing structure.

Replacement Alternative S-2 would avoid a transverse crossing of the EBMUD sewer outfall in the Bay.

Although Replacement Alternative S-2 would meet mandatory design standards at YBI and would avoid impacts to the EBMUD sewer outfall, it was withdrawn from further consideration due to concerns for the structural integrity of the existing cantilever section raised by connection of temporary detours.

2.7.7 Replacement Alternative S-3

Replacement Alternative S-3 represents a southern alignment design refinement to better address operational and safety geometric design standards in the YBI transition area. Replacement Alternative S-3 was set at the YBI approach to eliminate the need for design exceptions for superelevation of roadway curves. However, meeting geometric standards would move the main span tower away from YBI to a location where distance to rock suitable for tower footings would be in excess of 61 meters (200 feet). As explained under the CCSF Modified S-1 Alternative, the difficulty, cost, and safety of underwater construction increases with water depth. Specialized equipment may be required. And similar to Replacement Alternative S-1, Replacement Alternative S-3 would not provide bridge users with panoramic views.

Replacement Alternative S-3 would require construction of temporary detours similar to those described for Replacement Alternative S-2. This raised concerns for the structural integrity of the existing East Span cantilever span during construction.

Replacement Alternative S-3 would have impacts to the EBMUD outfall structure similar to those described for Replacement Alternative S-1.

Based on the inability to meet mandatory design standards for superelevation, constructibility issues for tie-in of temporary detours to the existing East Span, and impacts to the EBMUD sewer outfall, the Replacement Alternative S-3 was withdrawn from further consideration.

2.7.8 Double-deck Alternative

A double-deck replacement bridge was considered early in the evaluation of replacement alternatives. The double-deck alternative could be constructed on either

northern or southern alignments. It would provide five vehicular traffic lanes in each direction and inside and outside shoulders.

Preliminary cost estimates, prepared by Caltrans in 1996, indicated the double-deck replacement alternative would be more expensive than the single-deck alternatives.

A double-deck structure would limit views for lower-level bridge users. Lower deck views would be restricted by the upper deck roadway and supports as they are on the existing bridge.

Concerns for seismic reliability of double-deck structures have been raised because of extensive damage suffered by existing double-decked structures in recent seismic events, particularly Loma Prieta earthquake damage to the existing overhead truss section of the Bay Bridge East Span. It was determined that a seismically reliable double-deck replacement alternative could be designed. One method would be to construct an upper deck supported by columns straddling an independently supported lower structure. The resulting bridge substructure would be similar in mass to columns and footings for parallel structures.

Based on concerns over interaction of two structures in such close proximity during seismic events and the inability of the double-deck structure to provide panoramic views, the double-deck replacement alternative was withdrawn from further consideration.

2.7.9 Design Variations Considered

Profile

Replacement alternative refinement studies evaluated options for the bridge profile, which is the rise in roadway elevation from the Oakland Touchdown area to the YBI East Viaduct connection. Three profile variations—level approach grade, constant grade, and elevated grade—were evaluated.

Level Approach Grade profile refers to a vertical alignment that would remain level and near the water surface from the Oakland Touchdown area and begin elevation rise as far west as possible to provide required navigation clearance of 41 meters (135 feet) and conform to the existing YBI East Viaduct. A main span cable-supported design variation would be on such a grade.

Constant Grade indicates a vertical alignment rising at a consistent grade from the Oakland Touchdown area to meet main navigation opening clearance requirements and conform at YBI. A main span cable-supported design variation would be on a constant grade. The skyway of a cable-supported design variation would be on a constant grade until leveling on the main span where the cable-supported portion of the bridge adjoins the skyway portion of the bridge.

Elevated grade modifies the constant grade design variation rise at a slightly elevated grade between the Oakland Touchdown area and the main span. A main span cable-supported design variation would be level.

Traffic operational characteristics of each profile variation were evaluated with emphasis on the effect of roadway grade on truck speeds climbing the westbound grade. The analysis concluded that the range of a truck climbing speed difference among the three design variations was approximately six seconds and was not a substantial differentiation among the options[9].

Because no operational benefits would result from any of the profile design variations, it was not necessary to carry profile design variations to further levels of design refinement. The aesthetic impacts of profile variations were evaluated because the profile defines the line that the structures would draw across the horizon. Minor differences in the three design variations would be perceived from most views. At EDAP public meetings, a general preference was stated for the elevated grade profile design variation, because cable-supported main span design variations would have a symmetrical appearance from distant views and would contribute to bridge users' experience of passing through a portal.

There was no support for the level approach grade because it would have the appearance of the San Mateo Bridge, which, although functional and cost-effective, is considered to be inappropriate for the character sought for the East Span replacement structure.[10] It was withdrawn from further consideration. Caltrans performed a value analysis that resulted in substantial cost savings by lowering the profile at the main span tower to a position that was similar to the constant grade variation and acceptable to the overall bridge architecture. Additionally, with the inclusion of a bicycle/pedestrian path constructed at the same grade as the bridge, the constant grade rather than the elevated grade would produce slightly slower downhill speeds for bicyclists and result in improved safety. The elevated profile was considered but withdrawn for structural, economic, and marginally improved bicycle/pedestrian safety reasons.

Main Span Tower Design Variations

Cable-supported main span design variations were refined under the guidance of the EDAP. Progress designs up to the 30-percent design level for a representative replacement (Replacement Alternative N-6) were developed by two independent teams of structural engineers and architects. Extensive public participation and feedback were sought as part of the EDAP review of cable-supported design variations.

Designs for main span towers presented to the EDAP included a single tower between the parallel roadways and two "portal" towers with interconnected parallel towers arching over each structure. Portal towers considered included "H"-shaped and arched towers through which suspended roadway structures would pass. Single- and dual-tower design variations were created for both the cable-stayed and self-anchored suspension design variations.

[9] SFOBB East Span Retrofit Project Profile Grade Analysis Technical Memorandum, Parsons Brinckerhoff, October 29, 1997.
[10] San Francisco-Oakland East Bay Bridge Replacement, June 1998, prepared by T. Y. Lin International, A Joint Venture.

Single- and dual-tower configurations would meet seismic design criteria to provide a lifeline vehicular connection on the East Span alignment. Dual-tower configurations would require more columns and larger pile caps and footings compared to single-tower designs, increasing the amount of fill in U.S. waters and volume of Bay mud to be excavated during construction.

Following evaluation of seismic safety and aesthetic considerations, the EDAP recommended that main span design variations be designed with a single supporting tower. Based on the EDAP recommendation developed with extensive public comment during public meetings held in the spring and summer of 1998, the increased impacts to Waters of the U.S. required to construct dual towers, and the ability for all replacement alternatives to accommodate the single-tower main span design variations, the dual-tower design variation was withdrawn from further consideration.

Steel Retrofit

The option to retrofit the existing East Span columns with steel instead of encasing them in concrete was considered but was withdrawn from consideration.

The existing East Span has eccentrically braced steel frame towers that are the primary yielding (movement) points for seismic events. For the Retrofit Existing Structure Alternative, the primary yielding point for seismic events would be the junction of the substructure and the superstructure where the isolation bearings would be installed. Fundamental to this isolation strategy is that there would be no instability below the point of isolation. This would require that the existing towers be strengthened and stiffened. Concrete would provide this requisite stiffness.

It would also be possible to achieve the requisite stiffness using steel frames on the towers, but the construction methods are much more labor-intensive and costly than using cast-in-place concrete.

Other factors considered in selecting concrete encasement were that retrofitting with steel on a structure containing lead-based paint would require special measures for the protection of the public, workers, and the environment, and steel towers would require significantly more maintenance over the life span of the bridge.

Bicycle/Pedestrian Design Variations

Consideration of bicycle/pedestrian access options on East Span Project replacement alternatives was accomplished through a cooperative process among Caltrans, MTC, and members of the Bay Bridge Bicycle/Pedestrian Advisory Committee (BPAC). Alternative configurations for a path on the East Span replacement alternatives were considered in a series of workshops hosted by Caltrans in fall 1997 and early 1998. Several path locations were considered, including at-deck, below-deck, and above-deck, on either or both the westbound and eastbound structures; also considered was a path down the center between the decks. The outcome of the workshops, and

participation by the BPAC in the MTC Task Force public meetings, was the development of recommendations for either:

- A single path, 4.7 meters (15.5 feet) wide and 0.3 meter (1 foot) above the adjacent traffic lanes, located on the south side of the eastbound structure; or

- Two paths, each 3.3 meters (10 feet) wide at the same level as adjacent traffic lanes, located on the north side of the westbound structure and the south side of the eastbound structure.

BPAC's initial recommendation was a dual-path design, but was not selected by MTC because (1) the path on the north side of the westbound span heading uphill from Oakland to YBI could interfere with motorists' views, and (2) for security purposes (on days when the number of path users is moderate, it would be better to have users on one path than spreading them over two paths). The cost of the two paths would be greater and would require construction of a connection to the Oakland Touchdown area on the north side of the westbound lanes. This area would be immediately bordered by sand flats, eelgrass beds, and Bay waters, which would involve environmental and construction access constraints that do not exist with the single-path design. Based on the MTC Task Force recommendation, the dual-path and no-path design variations were withdrawn from further consideration and the replacement alternatives' descriptions were modified to include the single, south-side path.

2.7.10 Temporary Detours on Yerba Buena Island Considered and Withdrawn

Optional configurations and locations of YBI temporary detours were evaluated in an effort to avoid or minimize impacts to USCG and Navy facilities. Possible temporary detour configurations were to locate:

- Both eastbound and westbound temporary detours to the north of the existing East Span and each of the replacement alternatives;

- The westbound temporary detour north and the eastbound temporary detour south of the existing and replacement structures; or,

- Both temporary detours south of the existing and replacement structures.

Each of these configurations was analyzed for construction feasibility, impacts to YBI resources, traffic operational impacts, costs, and impacts on the project schedule. Based on analysis of conceptual engineering designs for the temporary detour options, the temporary detour options described below were withdrawn from further consideration.

Replacement Alternatives N-2 and N-6 North-north Temporary Detour Option

The north-north temporary detour would start as a double-deck roadway that becomes two side-by-side roadways approximately 200 meters (1,312 feet) east of the YBI

tunnel. The temporary detour would provide roadway connections from the eastern portal of YBI to the new eastbound and westbound main span structures and would not require connection to the existing truss bridge to accommodate traffic during construction. During construction, westbound traffic would travel directly from the new bridge to the westbound temporary detour lanes to the existing viaduct and tunnel, and eastbound traffic would travel directly from the tunnel and existing viaduct to the temporary detour lanes and onto the new bridge (see Figures 2-16.1 and 2-17.1 in Appendix A). The westbound lanes of the temporary detour would span the Admiral Nimitz house (Quarters 1), which was listed on the National Register of Historic Places in 1991. Quarters 1 is located within the Senior Officers' Quarters Historic District, which is eligible for listing on the National Register of Historic Places.

To provide the necessary support for the westbound temporary detour, a column would need to be placed within the eastbound traffic lanes at the point where the temporary detour makes a transition from a double-deck roadway to a side-by-side roadway. This would include a separation of lanes to both sides of the column, with three lanes on one side and two on the other side.

It was determined that splitting the eastbound mainline traffic would not be acceptable, primarily for traffic safety reasons. The column, even with appropriate crash cushion protection, would present a hazard. A single incident at the location could directly affect the operations of all five lanes, resulting in significant traffic and safety issues. The eastbound on-ramp from YBI is also in close proximity to the location of this lane split and column, creating an additional friction point within that section of roadway. Placement of a critical structural support element in the middle of mainline traffic was therefore determined to be too high a risk with regard to driver safety and structural integrity. For these reasons, the north-north temporary detour was determined to be unacceptable for the northern alternatives.

Replacement Alternatives N-2 and N-6 South-south Temporary Detour Option

The south-south temporary detour would be a full-length double-deck structure located south of the existing transition structure. Westbound traffic would travel on the upper deck of the existing bridge to the upper deck of the temporary detour, then to the YBI viaduct and tunnel. Eastbound traffic would exit the tunnel onto the lower deck of the temporary detour, then onto the lower deck of the existing bridge.

Eastbound traffic traveling from the YBI tunnel would be split around several columns with three travel lanes on one side of the columns and two lanes on the other. This would create a hazardous obstruction in the middle of mainline traffic lanes similar to that for the north-north temporary detour.

The south-south temporary detour option would minimize temporary ground disturbance to U.S. Navy property on YBI, although temporary impacts to the USCG station would increase. Construction of the south-south temporary detour options would require that an 88-meter (288-foot) section of the existing bridge be cut away and removed and replaced with the temporary detour. The replacement section would be constructed on YBI, then lifted in place. This replacement operation would require

complete closure of the existing East Span in both directions for a period lasting days. The total number of consecutive days of bridge closure is not known, but is estimated to be two weeks minimum. Because of the magnitude of the task to detach and remove the section of the existing bridge, potential for the construction period to be extended would be great.

Based on the hazards to motorists caused by complexity of construction and the requirement for complete closure of the entire East Span over a number of days, the south-south temporary detour option was withdrawn from further consideration.

Replacement Alternative S-4 North-north Temporary Detour Option

The north-north temporary detour option for Replacement Alternative S-4 would be a double-deck structure constructed north of the existing transition structure and existing East Span. Westbound traffic would travel on the upper deck of the existing bridge to the upper deck of the temporary detour then to the YBI tunnel. Eastbound traffic would exit the tunnel onto the lower deck of the temporary detour, then onto the lower deck of the existing bridge.

The north-north temporary detour option would be constructed as described for the south-south temporary detour option. It was withdrawn from further consideration for the constructibility and traffic operations reasons discussed for the south-south temporary detours.

Replacement Alternative S-4 South-south Temporary Detour Option

A south-south temporary detour for Replacement Alternative S-4 would be two parallel structures. Westbound traffic would be temporarily detoured from the existing bridge to the new structure and back to the tunnel. The eastbound structure would be placed south of the transition structure and existing East Span.

A south-south temporary detour option was identified for its potential to avoid temporary disturbance to U.S. Navy properties. However, it would have placed a temporary detour over residential buildings at the USCG station and temporary detours in the Bay. More detailed investigation indicated that the south-south temporary detour option would affect construction staging for Replacement Alternative S-4. Construction of the westbound temporary detour would conflict with placement of columns for the replacement structure and construction of the eastbound deck of the replacement structure. Based on the construction phasing conflicts, the south-south temporary detour option was withdrawn from further consideration.

CHAPTER 3
AFFECTED ENVIRONMENT

This chapter describes the physical and socioeconomic setting of the proposed SFOBB East Span Seismic Safety Project (East Span Project) and provides the baseline used to evaluate potential impacts. The project area encompasses land between the western portal of the Yerba Buena tunnel and the SFOBB Toll Plaza on the Oakland Touchdown area (Figure 2-2 in Appendix A). The project area includes additional land on Yerba Buena Island (YBI) to allow for construction activity related to the project. In the Bay, the project area includes sufficient area to accommodate all of the proposed alignments and allow for construction-related activity as described in Chapter 2.

In some locations, an area beyond the physical limits of the project, as described above is considered if there is the potential for environmental impacts to occur beyond those limits. Project area boundaries are described within individual sections of this chapter where they differ from the boundaries shown on Figure 2-2 in Appendix A. Where the term "Region" is used in this chapter, it refers to the entire nine-county Bay Area.

The following technical studies and analyses containing detailed information were conducted for the SFOBB East Span Project.

"Addendum Archaeological Survey Report – Maritime Archaeology," March 2000

"Addendum Finding of Adverse Effect," October 1999

"Air Quality Study Memorandum," March 1998

"Bicycle and Pedestrian Study Report," September 1998

"Biological Assessment," June 1999

"Biological Assessment (Retrofit Existing Bridge Alternative)," November 1996

"Community Impact Assessment," September 1998

"Conceptual Mitigation Plan for Special Aquatic Sites," November 2000

"Consideration of Proposed Mitigation Measures for Project Effects on Historic Buildings and Structures," September 1999

"CCSF S-1 Modified Alignment and the Impacts to the EBMUD Sewer Outfall," November 1999

"Dredged Material Management Plan," June 1999

"Final Relocation Impact Report," April 2001

"Finding of Adverse Effect: Buildings and Structures," September 1998

"Finding of Effect for Archaeological Resources," July 1998

"Hazardous Wastes Assessment," September 1998

"Historic Architecture Survey Report," July 1998

"Historic Property Survey Report," April 1996

"Land Use Issues Associated with the SFOBB East Span Seismic Safety Project and the Naval Station Treasure Island Draft Reuse Plan," January 2000

"Location Hydraulic Study," September 1998

"Natural Environment Study," September 1998

"Noise and Vibration Study," September 1998

"Phase I Archaeological Survey Report – Maritime Archaeology," February 2000

"Positive Archaeological Survey Report," June 1998

"Retrofit vs. Replacement," April 2000

"Sediment Sampling and Analysis Report," June 2000

"Supplemental Draft Section 4(f) Evaluation," June 1999

"Traffic Circulation, Access and Parking Assessment," September 1998

"Treatment BMP Feasibility Study," December 2000

"Visual Impact Assessment," September 1998

These studies are available for review at the locations listed in the Preface of this document. (Note: Because the Positive Archaeological Survey Report and Finding of Effect for Archaeological Resources contain confidential information about the locations of archaeological resources, they are not available for review.)

3.1 COMMUNITY SETTING

This section describes existing land uses in the project area and identifies and analyzes existing and projected social conditions in the project area so that the economic, demographic, service, and fiscal impacts of the East Span Project can be evaluated.

Socioeconomic and demographic data are presented for the U.S. Census Tracts that are within the project area and that could be potentially affected by the East Span Project. Census Tract 4017 in Oakland includes the Oakland Touchdown area; Census Tract 179.02 includes Yerba Buena Island (YBI) and Treasure Island (TI). To provide context for census tract data, they are compared to data for the cities of Oakland and San Francisco (YBI and TI are part of the City of San Francisco). Because the SFOBB is a regional facility, some demographic data are also presented at the county level. Figure 3-1 in Appendix A shows the Oakland and YBI/TI census tract locations in the project area.

3.1.1 Existing Land Uses in the Project Vicinity

Yerba Buena Island and Treasure Island

YBI and TI are primarily federally owned properties. YBI is currently under jurisdiction of and owned by the U.S. Coast Guard (USCG) and the Department of the Navy (Navy) with the exception of the land for right-of-way for all alternatives for the project under consideration, which was recently transferred to Caltrans (see discussion below under Caltrans for more details). These federal agencies must approve any activity on their property. In general, the Navy owns the property north of the existing East Span, as well as the ramps to and from the bridge; the USCG owns most of the property south of the bridge. See Figure 3-2 in Appendix A for the jurisdictional boundary. The Navy also owns TI and the causeway connecting YBI and TI.

YBI is a 59-hectare (147-acre) natural island. The USCG facility consists of 17 hectares (41 acres) and is located south of the existing SFOBB East Span. The area on YBI owned by the Navy is 34 hectares (86 acres). The existing East Span connects to the West Span at the YBI tunnel, which runs through the middle of the island. The Caltrans permanent right-of-way is 8 hectares (20 acres).

TI is a 163-hectare (403-acre) man-made island created by placement of fill in the Bay. A man-made causeway located northwest of YBI connects the two islands.

U.S. Navy. The Naval Station Treasure Island (NSTI), which comprises the Navy property on YBI and TI, encompasses 197 hectares (489 acres) of land. The NSTI was operational from the 1940s until 1997, when it was decommissioned. Within Navy jurisdiction on YBI, there are about 10 buildings previously used by the military primarily for storage, communications, fire safety, and administrative purposes. In addition, there are 105 housing units, 10 of which are large single-family residences originally built for officers; the remainder are 2, 3, and 4-unit buildings, generally single-story. Of these 105 units, about 95 housing units, located on the western and central parts of YBI, are currently occupied as market-rate civilian housing.

Land uses on the eastern side of YBI within the vicinity of the existing East Span include Quarters 1-7, shown on Figure 3-2 in Appendix A. Quarters 1-7 were built in the early 1900s as officers' quarters and comprise a Historic District eligible for listing on the National Register of Historic Places (refer to Section 3.10 for a discussion of Historic and Cultural Resources). Quarters 1-7 are currently undergoing renovation

and will eventually be leased out by the City and County of San Francisco (CCSF) as locations for events and meetings. Two other buildings (Buildings 213 and 262) are located on the eastern side of YBI. Building 213 is currently vacant; however, a fire truck owned by the CCSF is stored inside. Building 262, known as the Torpedo Building, was constructed in 1891 and is eligible for the National Register of Historic Places (see Section 3.10 — Historic and Cultural Resources). This building is vacant.

The 163 hectares (403 acres) at TI support 150 military buildings and 904 housing units. The military buildings served a broad range of functions, including medical/dental offices, a fire training facility, prison, administrative offices, a conference center, restaurants, and barracks, as well as storage for equipment and other miscellaneous items for a total of 0.23 million square meters (2.5 million square feet).

The Navy is seeking to dispose of its property on YBI and TI under the Defense Base Closure and Realignment Act of 1990, as amended. Through this process, jurisdictional authority will pass from Navy control, and the property within the former naval station will be available for reuse.

The laws and regulations guiding the base closure process require the Navy to consult with the Local Redevelopment Authority (LRA) and consider the LRA's plans as it decides how to dispose of NSTI. The CCSF is the LRA recognized by the Department of Defense as the agency responsible for planning the redevelopment of former NSTI. Accordingly, the Navy is working with the CCSF to coordinate base closure activities. A discussion of redevelopment plans for YBI is included in Section 3.1.2 below.

Notwithstanding the CCSF's status as the LRA in the base closure process, the Navy has not yet completed its analysis for the disposal and reuse of NSTI pursuant to the National Environmental Policy Act (NEPA). Although the Navy must consider the CCSF's plans for NSTI, the Navy has discretion to evaluate and decide among competing requests for the excess land. Pursuant to NEPA, the Navy must consider all reasonable disposal alternatives, including a "no action" alternative; the Navy has not disclosed what other alternatives are being considered; these will be publicly disclosed when the Navy circulates its Draft Environmental Impact Statement (DEIS) for the disposal and reuse of NSTI.

On October 25, 2000 and pursuant to 23 USC 107(d), the Federal Highway Administration (FHWA) executed a Federal Land Transfer of some land on YBI formerly owned by the United States. The right-of-way for the Interstate System was required over lands owned by the Department of the Navy. FHWA transferred land to Caltrans to give the state adequate right-of-way and control of access for construction of any of the alternatives for the East Span Project. There will be no physical changes until the Record of Decision (ROD) is approved for the East Span Project and construction begins. This Federal Land Transfer does not limit the evaluation of alternatives for the East Span Project, since the boundaries of the land transferred can accommodate any of the project alternatives under consideration. Any rights-of-way not required for the East Span Project will revert to the United States after project completion. The deed for

conveyance of property was recorded on October 26, 2000, with the CCSF County Records Office.

U.S. Coast Guard. The remaining property on YBI is owned by the USCG. It encompasses about 17 hectares (41 acres). The focus of USCG operations is a narrow half-mile strip of land at the eastern edge of the island. From this location, the USCG performs a variety of functions, including 24-hour search and rescue, law enforcement, and buoy repair and maintenance. Vessel traffic service is performed from a large communications tower at the top of YBI. Because of its search and rescue and law enforcement responsibilities, it is essential that the USCG be located at a waterfront site where boats can quickly accelerate to full speed. It is also very important for the unit to be centrally located to maintain adequate response times to emergency calls in the central and southern Bay.[1]

Residential facilities are provided for about 78 USCG personnel or USCG dependents who live on-site. Accommodations are also provided in the barracks for an additional 30 on-duty and temporary personnel. The Bachelor Enlisted Quarters (BEQ) encompasses 54 rooms with approximately 68 residents in a group of four buildings. There are also five single-family homes on the island for the families of officers housing approximately ten residents.

USCG administrative facilities on YBI consist of the following buildings (see Figure 3-2 in Appendix A):

- Building 40 - located at the entrance of the USCG facility. It is a two-story building used for administration;
- Buildings 22 and 23 - Station and group command office buildings located adjacent to the BEQ;
- Buildings 1-7 and 10-13 - A group of two- and three-story buildings located south of the buoy maintenance and repair area;
- Building 278 - Vessel Traffic Service (VTS) located on the main deck of a prefabricated metal building at the top of the YBI hill;
- Building 30 - equipment storage;
- Building 75 - storage; and
- Building 270 - vacant.

Industrial buildings are located at the southern end of the island. Maintenance, repair, and painting of buoys for the entire Bay Area are done at these industrial buildings.

[1] *Draft Group San Francisco Master Plan*, United States Coast Guard, 1995.

Recreational facilities on the island consist of outdoor tennis, basketball, and volleyball courts and a barbecue pit located next to Building 75.

Caltrans. As noted in this section under "U.S. Navy," the FHWA has transferred land, including fee ownership and construction easements, to Caltrans. The area now owned by Caltrans starts approximately 152 meters (500 feet) west of the western tunnel portal and runs through the tunnel and ends at about 256 meters (840 feet) east of the eastern tunnel portal for a total length of approximately 571 meters (1,875 feet). The width of the Caltrans property varies on the north side up to 44 meters (145 feet) from the centerline of the existing bridge and up to 38 meters (125 feet) from centerline on the south side.

Oakland Touchdown Area

The SFOBB touches down in the City of Oakland on a spit of land north of Port of Oakland facilities and west of the I-80/I-880/I-580 Interchange (distribution structure). The land in this area is owned by a number of public agencies, including the City of Oakland, the Port of Oakland, the State of California, and the U.S. Army. (Refer to Figure 3-3 in Appendix A.)

The State of California has a permanent easement for the right-of-way where the current I-80/SFOBB alignment is located. This property extends approximately 50 meters (164 feet) from the outer boundaries of the westbound and eastbound I-80 alignments and includes a median area between the two directions of travel.

The SFOBB Toll Plaza is located approximately 200 meters (655 feet) west of the distribution structure and extends across the westbound I-80 lanes. SFOBB Toll Plaza administrative facilities, maintenance buildings, a tow-truck operations base, and the SFOBB Traffic Operations Center are located south of the SFOBB Toll Plaza within the median area. SFOBB Toll Plaza workers also park in this area.

A Caltrans maintenance road extends the length of the project area within the Oakland Touchdown area on the south side of I-80. The roadway continues under the SFOBB and provides access to the north side of the bridge. Burma Road is also located on the south side of the touchdown. It extends from Maritime Street to the west end of the touchdown and is roughly parallel to the maintenance road. Burma Road was constructed by the U.S. Army and is now used by the Port of Oakland under a lease agreement. This roadway is blocked to public vehicular access about 1.6 kilometers (1 mile) from the west end of the touchdown. At this point, traffic is diverted onto the Caltrans maintenance road.

Various Caltrans storage, repair, and maintenance facilities are located between the Caltrans maintenance road and Burma Road, at the west end of the Oakland Touchdown area. The Caltrans Bay Bridge Substation and the Key Pier Substation, which were used during the era when the bridge carried trains, are also located in this area and are currently used for Caltrans maintenance activities. An East Bay Municipal Utility District (EBMUD) final dechlorination treatment station and outfall are also located in this area. The sewer outfall is 2.4 meters (8 feet) in diameter, 5 kilometers (3.1 miles) long, and extends 1.6 kilometers (1 mile) into the Bay.

A storage area for Caltrans construction materials and maintenance activities extends for about 1.6 kilometers (1 mile) between the Caltrans maintenance road and Burma Road. This property is owned by the City of Oakland. A billboard owned by the Port of Oakland is also located within this area. It is designated for community non-profit organizations and Oakland Airport-related media.

Four additional Caltrans buildings are located south of the SFOBB Toll Plaza and the maintenance road. The buildings are used for storage, maintenance, and repair materials associated with general maintenance of the bridge.

South of the Oakland Touchdown Area. The Port of Oakland (Port) extends from the south side of the Oakland Touchdown area and continues south along the San Francisco Bay shoreline to the Inner Harbor between the cities of Oakland and Alameda. The Port is a highly developed area of industrial, maritime, transportation, and commercial uses. Its deep-water berths and container cranes are supported by a network of warehouses, roadways connecting to freeways, and intermodal railyards. The Port also operates numerous non-maritime-related activities along its 30 kilometers (19 miles) of shoreline, including commercial real estate, two airports, recreational parks, wildlife refuges, and industrial facilities.

The U.S. Army owns the property on the south side of the Oakland Touchdown area, including Burma Road. Army property extends from near the end of the touchdown eastward and includes land on the east side of Maritime Street. The Oakland Army Base Military Traffic Management Command Center operated from this property until the Oakland Army Base was decommissioned in September 1999. The Oakland Army Base Reuse Authority (OBRA) together with the U.S. Army, the City of Oakland, and the Port of Oakland, recently adopted the Oakland Army Base Reuse Plan through the Base Realignment and Closure (BRAC) process. The reuse plan is discussed in Section 3.1.2 — Developable Land and Development Trends. Within this property, the Port operates the Bay Bridge public terminal on the shoreline south of the SFOBB Toll Plaza. The terminal currently handles break bulk (non-containerized) cargo. The Port plans to operate the terminal in the near term.

A container freight storage area is located between Burma Road and the Caltrans maintenance road, south of the SFOBB Toll Plaza. AMNAV, a private shipping company, is located on the south side of Burma Road and uses Pier 8 (adjacent to the Bay Bridge public terminal) for tug services. Burma Road continues eastward where it intersects with West Grand Avenue. West Grand Avenue provides access to and from I-80. A large shipping container storage area is located on property west of this intersection.

North Side of the Oakland Touchdown Area. The strip of land on the north side of the East Span is designated as a Resource Conservation Area in the City of Oakland General Plan.[2] Caltrans has a permanent easement on the first 50 meters (164 feet) of land to the north of the bridge; beyond this boundary, the land is owned

[2] *City of Oakland General Plan*, March 1998.

by the Port of Oakland. The Resource Conservation Area continues nearly 3.2 kilometers (2 miles) eastward from the touchdown before turning northward towards Emeryville.

The first 1.6-kilometer (1-mile) stretch of shoreline in Emeryville, known as the Emeryville Crescent, provides sensitive habitat for a variety of wildlife and special status species. The project area for the East Span Seismic Safety Project ends at Radio Point Beach, roughly 1,000 meters (3,300 feet) from the western end of the touchdown and approximately 2.4 kilometers (1.5 miles) from the Emeryville Crescent (see Figure 2-2 in Appendix A).

3.1.2 Developable Land and Development Trends

Yerba Buena Island and Treasure Island

Yerba Buena Island. In July 1996, a Draft Naval Station Treasure Island Reuse Plan[3] (1996 Draft Reuse Plan) was approved by the Office of Military Base Conversion, the CCSF, and the San Francisco Redevelopment Agency in anticipation of the closure of NSTI.

The conceptual land use plan for development on the eastern side of YBI (shown on Figure 4-1 in Appendix A) calls for a mixture of residential and visitor-serving uses. As noted in the "Implementation Strategy" section of the 1996 Draft Reuse Plan, proposed residential uses would include construction of 13 artisan cottages and 75 live/work units in 4 buildings with a total area of 6,968 square meters (75,000 square feet). Visitor-serving uses would include a 5,574-square-meter (60,000-square-foot) conference center that would be associated with Quarters 1-7. A height limit of 12.2 meters (40 feet) for eastern YBI is shown in the Plan. The 1996 Draft Reuse Plan also proposed reuse of Building 262 for uses such as art studios, a community center, additional live/work space, or a restaurant.

For western YBI, the 1996 Draft Reuse Plan calls for immediate utilization of the existing housing stock for market rate and homeless housing programs. At this time, however, the existing units on YBI are utilized as market-rate housing only. The plan envisions phased demolition and redevelopment of the housing stock on western YBI to develop higher density residential units (90 units) with either a hotel (150 rooms), a condominium development (100 units), or a lower density single-family development of 65 lots.

The 1996 Draft Reuse Plan envisions that development of TI/YBI would occur in five phases. Each phase would build on the previous phase to generate the revenue necessary to make needed infrastructure improvements which, in turn, would allow for more intensive development in subsequent phases. The phased implementation process is projected to extend over a period of 35 years. Development on YBI is envisioned to occur in the first three phases of plan implementation spanning a 15-year period. Development on eastern YBI, near the East Span, including the conference

[3] The City and County of San Francisco, Office of Military Base Conversion, Planning Department and the San Francisco Redevelopment Agency, *Draft Naval Station Treasure Island Reuse Plan*, July 1996.

center, artisan cottages, and live/work units, is included in Phase 3 and is scheduled to begin in 2007.

The proposed redevelopment of YBI set forth in the 1996 Draft Reuse Plan is subject to review and approval by BCDC under federal and state law to determine whether the proposed transfer of land to the CCSF and the proposed redevelopment of YBI are consistent with the Park Priority Use designation for YBI in the BCDC Bay Plan. The proposed uses in the Draft Reuse Plan would require amending the existing San Francisco Bay Plan to delete the park priority use designation at YBI. The San Francisco Bay Plan states, "If and when not needed by the Navy and Coast Guard, redevelop released areas for recreational use."

Development intended for the southeastern half of YBI, owned by the USCG, will improve base facilities and amenities, including new residential and light industrial uses. USCG does not currently have a master plan in place.

Treasure Island. Due to present underutilization and revenue-producing potential, TI is expected to be subject to intense development over the next 35 years. The CCSF and the Navy are currently preparing an EIR/EIS for TI and YBI to evaluate environmental impacts of proposed development on the property proposed for conveyance to the CCSF from the Navy. A market assessment in the 1996 Draft Reuse Plan concluded that "publicly oriented recreation and entertainment attractions" have been identified as particularly well-suited for the site.

In addition to these types of uses, the 1996 Draft Reuse Plan also considers land uses that would accommodate community facilities, major utilities, film production studios, and opportunities for non-profit institutions. New housing and shoreline open space on TI are also presented as potential uses.

According to the 1996 Draft Reuse Plan, expansion of the Treasure Island Marina was originally scheduled for Phase 2 development. Since the plan was written, the marina project has been accelerated. The conceptual marina development plan was approved by the Treasure Island Development Authority. Approval of the final marina development plan will require certification of an environmental document in compliance with the California Environmental Quality Act (CEQA) and NEPA.

Construction of the Treasure Island Marina is scheduled to begin in mid- to late-2001, after approval of the final plan, environmental document, and BCDC permit.

Oakland Touchdown Area

The Port of Oakland, Caltrans, the East Bay Regional Park District (EBRPD), and EBMUD all have plans for development or maintenance of existing facilities on the Oakland Touchdown area. One of these plans is the creation of a public park at the western end of the Oakland Touchdown area. Planning for the park is being led by EBRPD (see discussion below under East Bay Regional Park District).

Caltrans will continue to use a portion of the Oakland Touchdown area for maintenance access to the bridge approach and the SFOBB. In addition, Caltrans is planning a

separate project to reconstruct the toll plaza/administration area located just east of the Oakland Touchdown area.

Port of Oakland. The Port and the City of Oakland are currently seeking conveyance of the Oakland Army Base (OARB) located just south of the current eastern terminus of the SFOBB for economic and community development purposes. Under the existing plan, the 1998 Draft Final Reuse Plan for the Oakland Army Base (July 27, 1998) (Draft Final Reuse Plan), the Port of Oakland would develop a 194-acre Maritime District, including the OARB properties located west of Maritime Street and an expanded Knight Rail Yard. The City of Oakland would develop most of the remaining OARB area for non-maritime uses, with a primary focus on industrial, business, technology, and workforce training uses.[4]

The OBRA is considering a proposal to revise its Draft Final Reuse Plan. Under the proposed revised Draft Final Reuse Plan, the Port of Oakland would develop lands east of Maritime Street (located southeast of the Oakland Touchdown area outside of the project area limits) for maritime uses. The City of Oakland would develop the areas south of Burma Road as non-maritime uses (see Figure 3-3 in Appendix A). The reuse plan for the OARB, including the proposed revised plan, must be approved by OBRA, subject to environmental review.

The proposed revised Draft Final Reuse Plan for the Oakland Touchdown area, if approved by OBRA, would include conveyance of 4.9 hectares (12 acres) to the EBRPD for development of the Gateway Park at the western end of the Oakland Touchdown area. In the first iteration of the plan, this park was also included. FHWA has determined that the land to be conveyed is a protected Section 4(f) resource.

The San Francisco Bay Area Seaport Plan (Seaport Plan) identifies long-range plans by the Port of Oakland (Port) to expand its operations. The plan, originally approved by BCDC in 1982 and last amended in 1997, allows for expansion of Port facilities to 2017. Before Port expansion can proceed using Bay fill, marine terminal projects must meet the criteria specified in Section 66605(c) and (d) of the McAteer-Petris Act, administered by BCDC. Expansion plans are designed to meet the projected 2020 cargo volumes estimated in the Seaport Plan. Development of the Port's Joint Intermodal Terminal (JIT), located outside the East Span Project area limits, is currently under way.

On January 4, 2001, BCDC voted to amend the San Francisco Bay Plan and Seaport Plan by the "Port Priority Use" area designation from the Bay Bridge Site, Pier 7, and Bay Bridge Terminal (see Figure 3-3 in Appendix A). Deleting the "Port Priority Use" designation from these areas will allow the City of Oakland to implement a development plan for the area to accommodate non-maritime land uses. The deletion also eliminates the inconsistency between the BCDC's "Port Priority Use" designation and OBRA's designation of the land as a future park.

[4] The Oakland Army Base Reuse Authority, July 27, 1998, *Draft Final Reuse Plan for the Oakland Army Base*, Executive Summary, p. S-2.

Bay Conservation and Development Commission (BCDC) Permit 11-93.[5] As part of the I-880/Cypress Freeway Replacement Project, Caltrans is required by BCDC to provide and maintain a public access bicycle/pedestrian pathway system connecting the cities of Emeryville and Oakland between Shellmound Street and Nelson Mandela Parkway, through the distribution structure for I-80 to the Oakland Touchdown area. Caltrans is also required to provide two scenic overlooks, a 465-square-meter (5,000-square-foot) outlook on the north side of the Oakland Touchdown area and a 232-square-meter (2,500-square-foot) lookout area on the south side of the area. Both overlook areas would include public amenities such as restrooms, parking, benches, a fish cleaning facility, trash cans, and native landscaping. The EBRPD has plans to develop a much larger public park in the same area (see below). If the locations of all or portions of the conceptual overlooks and bikeway alignments prove infeasible due to replacement of the existing bridge, the permit conditions allow Caltrans to pay a fee in lieu of constructing the improvements, subject to BCDC approval.

East Bay Regional Park District (EBRPD). The EBRPD Advanced Planning Division is evaluating lands at the Oakland Touchdown area for potential acquisition and stewardship to develop an approximately 5.9-hectare (14.7-acre) public park to the south of the existing bridge and approach. Subsequent to publication of the East Span Project DEIS in 1998, the EBRPD was designated by OBRA as the lead agency in developing the proposed Gateway Park at the western end of the Oakland Touchdown area. EBRPD's Advanced Planning Division is coordinating park planning among the City of Oakland, the National Park Service, BCDC, and the Port of Oakland.

3.1.3 Adopted Goals and Policies

Land Use Policies

In addition to Caltrans, the public agencies with jurisdiction over or interest in land use in the project area are the Navy, the CCSF, City of Oakland, Port of Oakland, USCG, the EBRPD, BCDC, and EBMUD. This section reviews their existing policies and planning documents and identifies the guiding principles that relate to the proposed project.

U.S. Navy. The Navy is in the process of transferring the property known as NSTI as part of the BRAC process. For the purposes of the East Span FEIS, Caltrans assumed that the CCSF is the intended recipient of YBI. This assumption was based on the 1996 Draft Reuse Plan, the CCSF's role as Local Reuse Authority, and the currently in-force Base Caretaker Agreement between the Navy and CCSF. The transfer of property will be completed over the next few years.

The City and County of San Francisco/Treasure Island Development Authority. In 1997, the California Legislature passed AB699, the Treasure Island Conversion Act, vesting the Treasure Island Development Authority (TIDA) with full redevelopment authority for NSTI. In April 1997, the CCSF Board of Supervisors

[5] BCDC Permit No. 11-93 issued on June 8, 1994 (with amendments made October 19, 1994, April 14, 1995, and July 31, 1998). One more amendment is expected.

adopted Resolution 380-97 establishing TIDA as a nonprofit planning benefit corporation to promote the redevelopment of TI/YBI. The CCSF is projected to acquire ownership of TI and portions of YBI in the year 2003. A caretaker agreement between the CCSF and the Navy is currently in place. The caretaker agreement defines levels of maintenance on TI during the transfer and conveyance process and defines funding and service responsibilities. The 1996 Draft Reuse Plan serves as the guide for future activities on TI and CCSF-owned portions of YBI.

The following is a summary of land use policies from the 1996 Draft Reuse Plan which are relevant to development on YBI:

- Provide for new civilian uses that contribute to the economic well-being of the islands and San Francisco by generating jobs and revenues;
- Limit uses to those that can be accommodated primarily by ferry;
- Allow flexibility to respond to market opportunities and changes in technology over time;
- Attract initial uses and users that facilitate and are compatible with the development of desired long-term uses;
- At YBI, there are two sites where visitor-oriented uses are envisioned. They include: (1) the eastern end of the island where a portion of the property could be developed as an attraction that is tied by boat to activities taking place at TI; and (2) Quarters 1-7, which could be used for conference facilities and limited lodging; the properties total 5,574 square meters (60,000 square feet);
- Provide for the opportunity for publicly oriented uses at YBI;
- Allow for the expansion of publicly oriented uses;
- If the publicly oriented uses require a larger "footprint" and if circumstances make other properties available, the expansion of publicly oriented uses should be accommodated;
- In certain cases, areas are shown with multiple land use designations, providing the opportunity at TI and YBI to retain some flexibility and create an opportunity for a broader range of potential activities;
- Publicly oriented uses are a possibility at Yerba Buena Island, in the flatter areas on the eastern end of the island (including Quarters 1-7);
- Focus public open space on the natural features and amenities of the island setting;
- Protect hillside and shoreline open space at YBI;

- Maintain and expand waterfront recreational and transportation facilities to enliven the water's edge and improve access;

- The opportunity for ferry facilities should be developed (where possible) along YBI. In addition, the opportunity for berths and floats to serve smaller craft (such as water taxis) as well as ferries should be provided;

- Provide a range of institutional uses that can satisfy a broad range of public purposes. Encourage collaboration between users to reduce costs for facilities and services;

- Provide for existing and new housing at YBI; and

- For Yerba Buena Island, residential uses may include single-family attached and detached as well as live/work studios and artisan cottages. A maximum of 300 units would be allowed at YBI and would be distributed in both the hillside and flat land areas. As a general land use policy, the 300 housing unit figure is given by the 1996 Draft Reuse Plan to establish an upper limit of housing density on the island.

The City of Oakland. *Envision Oakland* is the title of the Land Use and Transportation Element of the Oakland General Plan that was adopted March 24, 1998. This document contains policies and actions for implementation of the community's vision for Oakland. *Envision Oakland* includes land use designations for the Oakland Touchdown area and adjacent areas.[6]

- The land immediately adjacent to the north of the existing touchdown is designated as Resource Conservation Area;

- The land immediately adjacent to and south of the existing touchdown is designated as General Industrial/Transportation; and

- An unspecified site within the land to be released by the Army as part of the Oakland Army Base Reuse and Closure Process, located on the southern half of the Oakland Touchdown area, has been proposed as Park and Open Space.

Transportation policies found in *Envision Oakland* reflect the City's priority to maintain exceptional access to and through Oakland for the wide variety of transportation modes that have historically existed within the city.

The Port of Oakland. As noted in Section 3.1.2 — Developable Land and Development Trends, the Port of Oakland and the City of Oakland have proposed a revision of OBRA's Draft Final Reuse Plan. The proposed revised Draft Final Reuse Plan would include policies to guide Port of Oakland development outside the project

[6] The City of Oakland, *Envision Oakland* (Draft for Public Hearings), October 1997, adopted March 24, 1998.

area and, if approved, would also convey land to the City of Oakland for economic development purposes.

U.S. Coast Guard. Although the USCG regularly prepares master plans for its various facilities, the USCG facility on YBI does not currently have a master plan in place. Finalization of a draft master plan, prepared in September 1995, is pending the results of the TI BRAC process and the final design for the East Span Project. Once the final design for the East Span Project has been chosen, the amount of land required from the USCG property can be determined. The completed master plan for the USCG properties will be based upon land remaining available for development.

East Bay Regional Park District. The EBRPD Master Plan (December 17, 1996) does not discuss specific areas within the East Bay. Instead, it presents the policies and procedures to be used for acquisition and stewardship of any lands to be placed under EBRPD management. As noted in Section 3.1.2 — Developable Land and Development Trends, the lands at the west end of the Oakland Touchdown area are currently being evaluated by the EBRPD Advanced Planning Division for potential acquisition and stewardship. The EBRPD has gone on record with BCDC stating its intention to develop a park (Gateway Park) on the Oakland Touchdown area.

The San Francisco Bay Conservation and Development Commission. The BCDC is a state agency and was created by the McAteer-Petris Act to regulate development in and around San Francisco Bay. After its creation, BCDC was designated as the Federal Coastal Zone Management Agency for San Francisco Bay in accordance with the Federal Coastal Zone Management Act (CZMA). The purpose of the CZMA is similar to that of the McAteer-Petris Act, to regulate development in coastal areas and to protect their unique resources. Under the McAteer-Petris Act, BCDC has jurisdiction over the entire Bay and a shoreline band 30 meters (100 feet) shoreward of the mean high tide line.

The McAteer-Petris Act contains findings and declarations that recognize the rapid development around the Bay and that establish the framework for developing and implementing the San Francisco Bay Plan. The McAteer-Petris Act addresses the need to allow for water-oriented land use while protecting the Bay from unnecessary filling and maximizing public access. Section 66602 states that "the San Francisco Bay Plan should make provision for adequate and suitable locations for certain water-oriented land uses along the Bay shoreline that are essential to the public welfare of the Bay Area, thereby minimizing the necessity for future Bay fill to create new sites for these uses. Maximum feasible public access should also be provided."

The McAteer-Petris Act provides additional guidelines to regulate fill within the Bay. The guidelines include the following recommendations:

- "That further filling of San Francisco Bay and certain waterways should be authorized only when public benefits from fill clearly exceed public detriment from the loss of the water areas and should be limited to water-oriented uses or minor fill for improving shoreline appearance or public access to the Bay;

- That fill in the Bay and certain waterways for any purpose should be authorized only when no alternative upland location is available for such purposes;
- That the water area authorized to be filled should be the minimum necessary to achieve the purpose of the fill;
- That the nature, location and extent of any fill should be such that it will minimize harmful effects to the Bay Area;
- That public health, safety and welfare require that fill be constructed in accordance with sound safety standards which will afford reasonable protection to persons and property against the hazards of unstable geologic or soil conditions or of flood or storm waters; and
- That fill should be authorized when the filling would to the maximum extent feasible, establish a permanent shoreline.

As part of its statutory mandate under the McAteer-Petris Act, BCDC prepared the San Francisco Bay Plan as its master planning document for San Francisco Bay. The Plan, adopted in 1969, as amended, outlines policies to guide future uses of the Bay and shoreline. The Bay Plan includes maps that apply these policies to the present Bay and shoreline.

Note: On November 4, 1999, BCDC voted 15-0-0 "...to support a solid fill alternative (vs. pile-supported fill) as most appropriate for the portion of the proposed East Span replacement structure where it reaches the shoreline in Oakland."[7] The vote was advisory and does not constitute granting of a permit.

The following Bay Plan policies are applicable to the current project:

- Any route over the Bay will be subject to: (a) placement on structure, not fill; (b) providing navigational clearance; (c) avoiding new fill for ancillary facilities , if possible; and (d) considering mass transit facilities (Transportation Policy 4) for new structures;
- Sedimentation resulting from dredging projects should be limited by: (a) placement as fill in approved fill projects; (b) barging or piping to suitable disposal sites in the ocean; (c) placement on dry land; or (d) if no other alternative is feasible, dumping in designated parts of the Bay (Dredging Policy 2;
- "Yerba Buena Island – If and when not needed by Navy or Coast Guard, redevelop released areas for recreational use";
- Marshes and mudflats should be maintained to the fullest possible extent to conserve fish and wildlife and to abate air and water pollution. Filling and diking that eliminate marshes and mudflats should, therefore, be allowed only for

[7] BCDC commission meeting minutes, November 4, 1999.

purposes providing substantial public benefits and only if there is no reasonable alternative. Marshes and mudflats are an integral part of the Bay tidal system and, therefore, should be protected in the same manner as open water areas; and

- New or remodeled bridges should be designed to permit maximum viewing of the Bay and its surroundings by motorists and pedestrians. Guard rails and bridge supports should be designed with views in mind.

The San Francisco Bay Area Seaport Plan, prepared by BCDC and the Metropolitan Transportation Commission (MTC), constitutes the maritime element of MTC's Regional Transportation Plan and is incorporated into BCDC's San Francisco Bay Plan. The relationship of the Seaport Plan to the project was addressed in Section 3.1.2 — Developable Land and Development Trends under "Port of Oakland."

East Bay Municipal Utility District (EBMUD). EBMUD owns, operates, and maintains facilities on the Oakland Touchdown within the project area. In letters of comment, EBMUD has expressed its concern with the potential environmental and financial problems resulting from construction of a southern alignment (see Section 3.1.6 — Community Services below).

3.1.4 Demographic Characteristics of the Project Area and Inclusive Census Tracts

The project is located within census tracts 179.02 which includes TI and YBI, and 4017 which includes a portion of West Oakland (Figure 3-1 in Appendix A). Although the project is located within these census tracts, the project area limits include YBI and the Oakland Touchdown area (Figure 2-2 in Appendix A) and do not contain any large populations or cohesive communities.

Demographic information for the two census tracts within the project study area is presented below. Each subsection includes a description of the demographic characteristics for the project area limits and the larger census tract.

The 1990 Census information does not reflect the current demographic profile of YBI/TI, due to the closure of Naval Station Treasure Island in September 1997. Consequently, the demographic profile is based on the TI project website, field surveys and interviews with Treasure Island Development Authority and Treasure Island Homeless Development Initiative staff. The 1990 Census is used for demographic information for the Oakland Touchdown area and adjoining census tract.

Detailed demographic information for the nine-county Bay area region can be found in the Community Impact Assessment technical report.

Household Characteristics

Project Area. On YBI, housing at the USCG facility consists of dormitory type housing (BEQ), and five single-family homes (occupied by officers). The total resident population at the facility is approximately 78 people.

On the portion of YBI under Navy ownership, the housing stock is managed by the Treasure Island Development Authority. The 95 multi-family housing units on YBI are leased at market rate to the general public.

There are no housing units within the project limits in the Oakland Touchdown area.

Outside the Project Area. All of the housing stock on TI consists of apartments, with the exception of the barracks which are dormitories. According to the Director of the Treasure Island Homeless Development Initiative, all of the available housing stock on TI is occupied by renters. The current resident population on TI is estimated to be 2,700. Of the 116 units currently leased as below-market rate housing, 66 units are occupied by families of 4 or more people and the remaining 50 are single-occupancy. An additional 96 units of below-market rate family housing is undergoing renovation and will be available soon.

According to the Treasure Island Project web pages, as of January 2000, 300 market rate units were rented on TI. Occupants include City of San Francisco employees (including teachers, firefighters, police officers) and college students.

The housing stock in Census Tract 4017, which includes the Oakland Touchdown area, was 62 percent renter-occupied according to the 1990 Census. Average household size in this census tract was 2.8 people per household. The closest housing units are located approximately 2.4 kilometers (1.5 miles) away from the project limits.

Ethnic Mix and Age Distribution

Project Area. The ethnic mix of the residents on YBI is likely to be diverse and reflect that of the San Francisco Bay Area.

Outside the Project Area. Of the 116 below-market rate units occupied on TI, families with 2 or more children occupy 66 units. The remaining 50 units are single-occupancy. Of the occupied below-market rate units, 80 percent of the population is African American and the remaining 20 percent represent other ethnic groups.

According to the 1990 Census, the population of Census Tract 4017 in West Oakland is 63 percent African-American, 16 percent Asian and 7 percent Caucasian. Other ethnic groups made up the remaining 21 percent of the population.

Jobs and Employment

Project Area. The USCG employs 149 military and 1 civilian personnel. The characteristics of the current YBI labor force (outside the USCG facility) have not been documented; however, it is assumed that employment on the island is centered on rehabilitation and maintenance of the housing stock and historic structures.

The unemployment rate for the CCSF, overall, is 3 percent.[8]

[8] State of California, Employment Development Department, Labor Market Information Division, Labor Force Data for Sub-County, 1999 Benchmark, March 28, 2000.

Outside the Project Area. The characteristics of the current TI labor force have not been documented. It is estimated that the daytime population on TI is 4,000. Employment centers on TI include the Job Corps Culinary Center, film studios, the Treasure Island Development Authority offices, a restaurant, convenience store, public services (police and fire) and the Treasure Island Elementary/Middle School.

Almost 30 percent of the labor force in Census Tract 4017 in West Oakland was employed in craft or laborer positions in 1990. The unemployment rate was 24 percent in 1990. The current unemployment rate for the City of Oakland, overall, is 5.5 percent.[9]

According to a 1995 survey, there were approximately 488 businesses and employers in West Oakland (which includes areas outside of Census Tract 4017). At the time of the survey, the largest employer in the West Oakland community was the United States Postal Service.[10] Another large employer, the Oakland Army Base, was closed in 1999 and is undergoing the base realignment and closure process to transfer the land to the City of Oakland and the Port of Oakland.

Income Levels

Project Area Limits. Income information for residents of YBI is not available until the 2000 Census is released.

Outside the Project Area. To qualify for the below-market rate housing on TI, residents must meet the U.S. Department of Health and Human Services income criteria, which in 2000 is $17,054 for a family of four. Income level information for other residents and military personnel is not available. None of the below-market rate housing is within the project area on YBI, so there is no identifiable low-income population on YBI.

In 1990, 21 percent of the residents of Census Tract 4017 were classified as living below the poverty level. Average household and per capita incomes were approximately 50 percent lower than Oakland as a whole. There are no households (low-income, minority, or otherwise) within the project area at the Oakland Touchdown area.

3.1.5 Fiscal Conditions

San Francisco

Primary sources of the CCSF General Fund are various taxes and state subventions. Approximately 30 percent of the 2000-2001 General Fund came from tax revenues; the remaining 70 percent is derived from federal and state grants, charges for specific purposes, and other revenues.

[9] State of California, Employment Development Department, Labor Market Information Division, Labor Force Data for Sub-County, 1999 Benchmark, March 28, 2000.

[10] Economic Development Advisory Board of the County of Alameda, *West Oakland 2000 Transportation and Economic Development Study*, 1997.

According to the Mayor's 2000-2001 budget, 41 percent of the General Fund was for public works and transportation, 11 percent for public health, 17 percent for social services, 5 percent for culture and recreation, 7 percent for administration and finance, 6 percent for general obligations, and 13 percent for public protection.

The CCSF prepared the 1996 Draft Reuse Plan to address redevelopment of TI and portions of YBI currently and formerly owned by the Navy. Some of the land formerly owned by the Navy was recently transferred to Caltrans. The land was transferred to give the state adequate right-of-way and control of access for construction over lands for the East Span Project. A large investment in infrastructure is required to support redevelopment and, as noted in Section 3.1.2 — Developable Land and Development Trends, planned development of TI/YBI will be phased in order to generate revenue to pay for necessary infrastructure improvements.

Oakland

The city share of property tax which goes into the Oakland General Fund is less than 22 percent. The largest share of property tax collected in Oakland goes to Alameda County, special districts, and school districts. In the 1998-99 budget, 53 percent of the General Fund was allocated to police and fire activities, 8.3 percent went to public works and neighborhood development, and 8.6 percent was for culture and recreation.

3.1.6 Community Services

Utilities

Water Supply. The San Francisco Water Department (SFWD) supplies water to TI and YBI via steel pipes attached to the West Span. Backup water supply is provided by a line on the East Span that is owned by the Navy and is operated and maintained by the CCSF through a caretaker agreement. The pipeline conveys water from the EBMUD. Both sources of water are used for fire protection and domestic purposes.[11] (Refer to Figures 3-30a and 3-30b in Appendix A for existing utilities on YBI and the Oakland Touchdown area.)

EBMUD is also responsible for the water supply at the Oakland end of the bridge. It has a supply pipe to the SFOBB Toll Plaza and Caltrans maintenance buildings, as well as pipelines that traverse the property of the former Oakland Army Base.

Sewer and Sewage Treatment. All wastewater generated on TI and YBI is treated at the sewage treatment plant located at the northeast corner of TI.[12]

Sewage service and treatment in the East Bay are provided by EBMUD. The treatment plant is located just south of the distribution structure to the east of the SFOBB Toll Plaza. A major EBMUD sewer outfall line parallels the bridge approach to the south. Other EBMUD facilities include an effluent pump station near the SFOBB Toll Plaza, a dechlorination facility south of the eastbound lanes approximately 183 meters (600

[11] *Treasure Island Reuse Plan, Physical Characteristics, Building and Infrastructure Conditions*, June 1995.

[12] *TI Reuse Plan, Physical Characteristics, Building and Infrastructure Conditions*, June 1995.

feet) east of the existing bridge takeoff point, and an outfall drop structure adjacent to the shoreline where the outfall transitions to the water.[13] (Refer to Figure 3-3 in Appendix A.)

Storm Drains. At the Oakland Touchdown, the storm drain system consists of pipes and various outfalls along the perimeter of the spit, which discharge directly into San Francisco Bay. The storm drain system on TI/YBI consists of pipes and various outfalls along the perimeter of TI and YBI, which discharge directly into San Francisco Bay.

Electrical Infrastructure. Electrical power is provided to TI and YBI via a Navy-owned power line which is elevated along the south side of the approach to the bridge, crosses under the bridge, and then transitions near the incline to a 12 KV (in a 34.5 KV casing) submarine cable owned by the Navy and the CCSF. The Oakland cable is connected to the Navy's Davis Substation located at the former Fleet and Industrial Supply Center (FISC) site in Oakland.

In the Oakland Touchdown area, there are several electrical power lines. South of the existing SFOBB, there are a 480 KV and two 12 KV overhead lines mounted on poles. One 12 KV line is owned by Caltrans. The other 12 KV line and the 480 KV line are owned by Pacific Gas & Electric Co. (PG&E). From the substation, the 12 KV line extends underground onto the existing SFOBB. North of the existing SFOBB, there is an underground 5 KV line running along I-80.

Telecommunications Infrastructure. Telecommunications service is provided to TI and YBI from San Francisco via a conduit system located on the West Span of the SFOBB.

Pacific Bell and a consortium have fiber optic cables and telephone lines located south of the existing SFOBB on YBI and in the Oakland Touchdown area and on the existing SFOBB. Three mobile phone sites are located on YBI, owned by Verizon Communications, Cingular Wireless, and AT&T Wireless.

Natural Gas Infrastructure. Natural gas is provided to YBI and TI by PG&E from Oakland via a 254-millimeter (10-inch) diameter high-pressure submarine gas main. The line is located on the south side of the existing bridge, crossing under the bridge near the west end of the Oakland Touchdown and entering the Bay north of the bridge where it continues on to YBI/TI.

Police and Fire

The California Highway Patrol (CHP) has jurisdiction over I-80 and the SFOBB for matters involving both traffic and emergency services. Calls from the east and west segments of the bridge are taken by CHP offices in Oakland and San Francisco, respectively. Municipal police departments are not responsible for state bridges and roads unless they are asked to participate in a specific joint investigation or action.

[13] Jimmy Yoloye, EBMUD, oral communication.

The Oakland CHP office is located at 3601 Telegraph Avenue, close to the interchange of I-580, 24, and I-980 and approximately 1.6 kilometers (1 mile) east of I-80 and the approach to the SFOBB. The CHP office in San Francisco is located on Eighth Street adjacent to the on- and off-ramps for the bridge. In addition, there is a police station on TI which was taken over from the Navy and has been operated by the San Francisco Police Department since late 1997.

The delivery of fire and emergency services within the project area is shared by several jurisdictions, due to the complexity of access to the various segments of the SFOBB and the YBI tunnel. Fires or medical emergencies on the westbound East Span are covered primarily by the Oakland Fire Department with assistance from the Emeryville Fire Department. Two Oakland fire stations and one Emeryville fire station are available to handle emergencies on the East Span.

The San Francisco Fire Department's (SFFD) Fire Station #48 on TI has primary responsibility to cover incidents on the upper deck (westbound) of the SFOBB from the tunnel to the San Francisco anchorage and on the lower deck (eastbound) from YBI to Oakland. Additional coverage is provided by two SFFD stations on mainland San Francisco which cover the lower (eastbound) deck west of and inside the YBI tunnel.

Schools

There is a school on TI which is part of the San Francisco Unified School District. It includes grades kindergarten through eighth, and over 40 percent of the students participate in programs funded by Chapter 1 to benefit children from low-income families. There is also a Federal Job Corps Culinary Training Program on TI. In Oakland, there are several private and public schools in Census Tract 4017, but the closest school is approximately 3 kilometers (2 miles) from the Oakland Touchdown. In addition, at the former Oakland Army Base, there is a child development center which will remain in operation either at its current location or at a relocated site after the base is transferred to civilian ownership.

Cultural and Recreational Facilities

There are a variety of recreation facilities on TI, including a 103-slip marina in the lagoon between TI and YBI, a fishing pier, parks, ball fields, tennis courts, and a golf driving range. There are a number of indoor recreation resources formerly operated by the Navy. The only recreation area on YBI is on USCG property, and includes a tennis court, basketball courts, and a volleyball court for use by USCG personnel.

Radio Point Beach is located north of the bridge approach and west of the SFOBB Toll Plaza at the end of Radio Road. BCDC requirements for the I-880/Cypress Freeway Replacement Project are discussed in Section 3.1.2 — Developable Land and Development Trends under "Bay Conservation and Development Commission Permit 11-93." If the permit conditions cannot be implemented, the permit allows Caltrans to pay a fee in lieu of constructing the improvements, subject to BCDC approval.

3.1.7 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, signed by President Clinton on February 11, 1994, directs federal agencies to take appropriate and necessary steps to identify and address disproportionately high and adverse impacts of federal projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law.

The Executive Order requires each Federal agency to take the appropriate steps to identify and avoid any disproportionately high and adverse human health or environmental impacts of Federal programs, policies and activities on minority and low-income populations.

Project Area Limits. The population on YBI in the market-rate rental housing is comprised of diverse racial, ethnic, and income groups. The population is not considered a readily identifiable minority or low-income population or community.

Outside the Project Area. As noted in Section 3.1.4 — Demographic Characteristics of the Project Area and Inclusive Census Tracts, the census tracts encompassing YBI/TI and the Oakland Touchdown area contain identifiable minority and low-income communities; however, these communities are outside of the project area.

3.2 TRANSPORTATION SETTING

This section describes existing and planned transportation facilities in the project vicinity, including the local street and highway system, passenger rail and public transit facilities, bicycle and pedestrian facilities, maritime facilities, and parking facilities. Existing and projected future travel demand are also discussed.

3.2.1 Traffic

Existing Street and Highway System

The traffic study area includes I-80 between Yerba Buena Island (YBI) and the SFOBB Toll Plaza, the freeway ramps on YBI, and local streets on YBI and in the Oakland Touchdown area.

The existing San Francisco-Oakland Bay Bridge (SFOBB) is a double-deck structure. Eastbound traffic travels on the lower deck and westbound traffic travels on the upper deck. The bridge currently accommodates cars, buses, trucks, and motorcycles. There are five 3.3-meter (11-foot) travel lanes on each deck and no shoulders. The posted speed limit is 80 kph (50 mph) for both directions.

YBI is directly linked to the SFOBB by a set of freeway ramps that allow access to and from east- and westbound bridge lanes. There are six ramps, including two westbound on-ramps, one westbound off-ramp, one eastbound on-ramp, and two eastbound off-ramps. The YBI ramps are shown in Figure 3-4 in Appendix A.

On YBI, there are two main roadways: Macalla Road and Treasure Island Road. Macalla Road connects to Treasure Island Road via Southgate Road. Macalla Road also provides access to the northern part of YBI, including most of the housing and the United States Coast Guard (USCG) station. Treasure Island Road traverses the west side of YBI and provides access to Treasure Island (TI). Figure 3-5 in Appendix A shows the YBI street system.

The I-80 freeway, SFOBB Toll Plaza, and existing bridge touchdown dominate the Oakland Touchdown area. Vehicle access to the area is primarily from the distribution structure. Westbound high-occupancy vehicle (HOV) lanes extend to the north and south sides of the SFOBB Toll Plaza from I-80, I-580, and I-880. They terminate on the west side of the SFOBB Toll Plaza where HOV traffic merges with mixed-flow traffic.

Local roadways providing access to the Oakland Touchdown area include Burma Road, an extension of West Grand Avenue, and Maritime Street. These streets are located outside of the project area; however, they provide access to the Oakland Touchdown area and could potentially be affected by the project. These roadways generally have low traffic volume, but it consists of a high percentage of trucks serving the Port of Oakland and local industry. There are other roads in the area which provide access for Caltrans vehicles to the SFOBB Toll Plaza, Caltrans maintenance facility, and auto access to Radio Point Beach and the area to the south of the bridge abutment. Figure 3-6 in Appendix A shows the Oakland Touchdown area roadways,

and Figure 3-7 in Appendix A includes the streets outside of the project area that provide access to the Oakland Touchdown area.

Future Roadway Improvements

The 1996 Draft Reuse Plan for Naval Station Treasure Island (NSTI), which documents the CCSF's redevelopment proposals, includes a Draft Circulation Element for TI and YBI. Due to the limited capacity of the on- and off-ramps connecting YBI with the SFOBB, automobile access to the islands is de-emphasized in the Circulation Element. Instead, the focus is on ferry access to the islands and alternative modes of transportation for circulation on the islands such as foot, bicycle, and shuttle buses. A bus shuttle system would provide service from the TI ferry terminal to TI and YBI, along Macalla and Treasure Island Roads.

The Circulation Element also calls for minor changes in circulation on YBI. The element proposes limited improvements to emergency access. Due to the steep terrain and the threat of landslides, most of the streets on YBI, including Macalla Road, would remain in their current configuration. The SFOBB on- and off-ramps would remain in their present configuration. Treasure Island Road would remain the primary access route between the SFOBB and TI.

No major roadway changes are planned for public roadways within the Oakland Touchdown area. The reconstruction of the SFOBB Toll Plaza may include some minor access improvements to the Toll Plaza parking area.

Existing and Projected Traffic Demand

The SFOBB is the primary motor vehicle link between San Francisco and the San Francisco Peninsula and the East Bay. The westbound approaches are congested during the morning commute period, and the eastbound approaches are congested during the evening peak period. During these times, the SFOBB operates at capacity. The SFOBB is also heavily traveled during off-peak travel times. Traffic flow on the SFOBB is vulnerable to congestion due to stalls, accidents, lane closures required for bridge maintenance, and the lack of shoulders for clearing stopped vehicles. Approximately 272,000 vehicles use the SFOBB daily. In the morning peak-hour, 10,800 westbound vehicles use the SFOBB.

The freeway ramps to and from the SFOBB on YBI typically operate with no more than 200 vehicles during the peak hour. Despite low traffic volumes, the eastbound on-ramp operates at capacity in the afternoon peak hour due to severely restricted design limitations (e.g., tight curves and short merges onto the bridge).

All of the local streets in the project area (YBI, TI, and the Oakland Touchdown area) currently operate with low traffic volumes. The streets in the Oakland Touchdown area serve primarily truck traffic.

In the future, peak-hour traffic demands on the approaches to the SFOBB are expected to increase. These increases would be due to increased demand for travel between the East and West Bay Area. Traffic volumes for westbound PM peak and eastbound AM peak may increase due to possible changes in commute patterns. Also, Average

Daily Traffic (ADT) may increase due to unused capacity available during off-peak travel times. However, traffic volumes on the bridge are expected to remain fairly constant during the westbound AM peak period and the eastbound PM peak period because the bridge constrains traffic volumes.

3.2.2 Transit

Alameda-Contra Costa Transit District (AC Transit), the provider of transbay bus service, currently operates 37 transbay bus routes, totaling 654 daily bus trips, between East Bay cities and the Transbay Transit Terminal in San Francisco. Service is provided during daytime and evening hours with most service provided during morning and afternoon commute periods. Transbay buses access the SFOBB via West Grand Avenue, Maritime Street, I-580, I-80, and I-880. The buses use the HOV lanes at the SFOBB Toll Plaza. West Grand Avenue is a major access route for nine AC Transit Transbay routes. Two bus routes (one transbay, one local) also operate on Maritime Street. There are no public transit routes operating on surface streets in the Oakland Touchdown area. In 1998, AC Transit carried about 13,000 passengers across the bridge per day and between 2,100 and 3,200 in the PM peak hour.

The San Francisco Municipal Railway (Muni) provides local bus service (Route 108) between TI and the Transbay Transit Terminal in San Francisco via the SFOBB. Route 108 operates at hourly headways on weekdays and serves a bus stop at the TI gate and a bus stop on YBI for the USCG facility.

Bay Area Rapid Transit (BART) provides about 546 daily transbay trains in the corridor. BART carries about 148,900 transbay passengers per day and approximately 30,000 passengers in the two-hour peak commute period each morning and afternoon.

3.2.3 Non-Motorized Traffic: Bicycles and Pedestrians

Existing Facilities

Bicycles and pedestrians are prohibited from using the SFOBB. No bicycle or pedestrian facilities exist elsewhere within the project limits, except for a few pedestrian facilities on YBI that include sidewalks, footpaths, and stairways. Most of the roadways on the island are not designed to accommodate pedestrians and bicycles, but do not explicitly forbid non-motorized travel. The 1996 Draft Reuse Plan identifies bicycle and pedestrian travel as important future travel modes on YBI and TI. (See Figure 3-5 in Appendix A for existing streets and pedestrian facilities on YBI.)

Currently, bicyclists and pedestrians have several transit options for travel in the SFOBB corridor:

- BART operates 546 daily transbay trains. Bicycle ridership in 1997 on the entire BART system was about 700 bicyclists per day. Rules governing bicycle use on BART changed in 1998 to allow expanded use. Current ridership data are not available;

- AC Transit operates 37 transbay bus routes that provide 654 daily bus trips between the East Bay and the Transbay Transit Terminal. AC Transit intends to outfit all 700 buses in its fleet with bicycle racks. Once equipped with a bicycle rack, each bus would be able to accommodate two bicycles at a time;

- The Alameda-Oakland-San Francisco Ferry currently carries about 10 to 15 bicyclists per day during the week and higher numbers on the weekends; and

- The Caltrans bicycle shuttle transports bicyclists between the MacArthur BART station and the Transbay Transit Terminal in San Francisco. The shuttle makes four daily morning departures from Oakland and three departures from San Francisco and four San Francisco and three Oakland departures in the evening. The shuttle carries about 1,500 to 2,000 bicyclists per month.

Planned Bicycle and Pedestrian Facilities

Several bikeway and pedestrian facilities have been planned in the East Bay portion of the study area:

- A bikeway is proposed on Maritime Street as mitigation for impacts created by Port of Oakland projects. The City of Oakland is responsible for planning the facility although no completion date has been identified;

- A bikeway is proposed by the City of Oakland on Seventh Street to provide access to Portview Park, which is located at the western end of Seventh Street, adjacent to the Seventh Street Marine Container Terminal;

- A bikeway on West Grand Avenue between Maritime Street and Mandela Parkway is planned by Caltrans as part of the I-880/Cypress Freeway Replacement Project and the I-80 HOV lanes and Operational Improvement Project;

- A bikeway to be located adjacent to eastbound I-80 is required as a condition of BCDC Permit 11-93 for the I-880/Cypress Freeway Replacement Project. In concept, it would follow the Caltrans maintenance road and provide access to proposed scenic overlooks at the Oakland Touchdown area as well as connect to the Bay Trail system; and

- The Bay Trail is a regional hiking and bicycling trail planned to ring the shoreline of San Francisco and San Pablo Bays. The SFOBB and the region's other toll bridges are all designated as part of the "spine" trail of the Bay Trail.[14] The spine trail creates the backbone of the Bay Trail system, encircling and crossing the Bay and providing a continuous transportation and recreational corridor in all nine Bay Area counties. To date, slightly more than half the length of the proposed Bay Trail system has been completed. Figure 3-7 in Appendix A shows these planned improvements.

[14] Association of Bay Area Governments, *Bay Trail Plan*, Figure III-3, July 1989.

3.2.4 Maritime Traffic

Ferries

Two companies provide ferry service between the East Bay and San Francisco. The Alameda/Oakland Ferry provides 13 daily round trips from Jack London Square in Oakland to the San Francisco Ferry Building and six daily trips to Pier 39 in San Francisco. All trips make a stop at the Alameda Main Street Terminal. None of the terminals are located within the project area. The ferries pass below the SFOBB West Span on their route and do not travel through the SFOBB East Span Project area.

Harbor Bay Maritime also provides ferry service between San Francisco and the East Bay. The only East Bay stop is made at Harbor Island in Alameda, outside the project limits. These ferries pass below the SFOBB West Span on their route across the Bay to the Ferry Building in San Francisco and do not travel through the East Span Project area.

Maritime Operations

The SFOBB traverses the Central Bay Subregion of the San Francisco Bay between the cities of San Francisco and Oakland. The western portion of the Central Bay is characterized by relatively deep water, high tidal water exchange through the Golden Gate, and strong currents. This area is dominated by rocky shorelines. The eastern portion of the Central Bay is dominated by shallow mudflats.

The San Francisco Bay is used by commercial and recreational maritime traffic. The main navigation opening under the East Span of the SFOBB is located between Piers E2 and E3. It is used by commercial navigation traveling under the East Span (the main navigation opening is shown on Figure 2-9 in Appendix A). It is approximately 405 meters (1,328 feet) wide with 56 meters (184 feet) of vertical clearance above mean high water. The controlling depth in this area is 7.6 meters (25 feet). The largest commercial vessels using this waterway are tug and fuel barge combinations, derricks, dredges, tour boats, and occasionally small freighters. The USCG has established a regulated navigation area for the portion of San Francisco Bay east of YBI, precluding vessels of more than 1,450 gross tonnes (1,600 gross tons) or tugs with a tow of 1,450 gross tonnes (1,600 gross tons) or more from meeting, crossing, or overtaking a vessel of similar size. Larger commercial vessels transit beneath the SFOBB west of YBI.

Two maritime facilities are currently located within the project area. They are the Port of Oakland's Bay Bridge Terminal area and the USCG moorings on YBI. However, recent amendments to BCDC's San Francisco Bay Plan and Seaport Plan have changed land use designations in the Bay Bridge Terminal area. The "Port Priority Use" has been deleted. In addition, there is an existing pleasure/recreational craft marina on TI at Clipper Cove. The CCSF is in the process of expanding services and making improvements to Clipper Cove.

3.2.5 Truck Routes and Truck Traffic

Trucks are a major component of vehicular traffic on certain study area roadways. I-80 is a major local, regional, and interstate truck route, carrying approximately 8,430 truck trips daily on the SFOBB, or about three percent of the annual average daily traffic (AADT) volume.[15] Local streets, including Maritime Street, Burma Road, and the maintenance roads in the Oakland Touchdown area serve primarily truck traffic associated with the Port of Oakland.

3.2.6 Parking

Yerba Buena Island

One paved area used for parking is located within the project area on YBI. It is located east of Quarters 1 and can accommodate approximately 315 parking spaces. This area was formerly used for special events at the Officers' Quarters and is now controlled by Caltrans through a temporary construction easement. During construction, Navy/CCSF will need to contact and get permission from Caltrans if they would like to use it. On-street parking within the project area is difficult because the roadways are narrow; however, two designated on-street spaces are located just south of the SFOBB on Treasure Island Road. Additional on-street parking is located in the residential neighborhoods at former Navy facilities and at current USCG facilities.

Oakland Touchdown Area

In the Oakland Touchdown area, parking for SFOBB Toll Plaza and other workers currently exists in the median area between the westbound and eastbound lanes of I-80. Other land uses in the touchdown area have "informal" parking areas because the land is open and flat. In addition, under BCDC Permit 11-93, Caltrans is required to provide six parking spaces on the south side of the Oakland Touchdown for use by visitors to the view lookout areas.

3.2.7 Federal Aviation Administration

The existing and proposed SFOBB structures are required to conform to Federal Aviation Administration (FAA) Regulations Part 77, "Objects Affecting Navigable Airspace." The conformance requires both obstruction marking and lighting in accordance with FAA Advisory Circular AC70/7460 effective January 1, 1996.

3.2.8 United States Coast Guard

The existing and proposed SFOBB structures are required to conform to USCG Regulations Parts 114 and 115 of Title 33, Code of Federal Regulations. Conformance with these regulations requires that marine navigation channels remain navigable during and after construction. The appropriate levels of lighting and obstruction markings are required to identify permanent and temporary bridge structures.

[15] Caltrans, *1998 Traffic Volumes on the California State Highway System*, April 2000.

3.3 VISUAL SETTING

As described below, the visual setting was evaluated from 20 viewpoints around the Bay Area and within each of the distinct landscape units which make up the study area. For more information on this visual assessment, the Visual Impact Assessment technical report is available at the locations listed in the Preface of this document. The Visual Impact Assessment technical report includes a CD-ROM with photographs, simulated drive-throughs, and an interactive map of visual simulations. Since publication of the Visual Impact Assessment, three additional viewpoints have been added to the visual analysis in response to agency comments. As a result, the three additional viewpoints are discussed in this EIS (see Figures 4-15a through 4-17c in Appendix A), but not included in the Visual Impact Assessment technical report.

3.3.1 Existing Visual Character and Context

Regional Landscape and Scenic Resources

The Bay Area is one of the most scenic areas of the world, combining water, islands, urban skylines, bridges, and mountains into picturesque and impressive vistas. Seven different bridges span the Bay, each one constituting a significant scenic resource in its own right. The Golden Gate Bridge is known around the world for its grace and beauty. However, all seven bridges, including the San Francisco-Oakland Bay Bridge (SFOBB), the Richmond-San Rafael Bridge, the San Mateo-Hayward Bridge, and the Dumbarton Bridge, span significant stretches of open water and are highly visible from vantage points around the Bay. San Francisco Bay extends over 97 kilometers (60 miles) from the Sacramento River Delta to the marshlands of Santa Clara County, a total of more than 1,000 square kilometers (386 square miles). The Bay is a rich marine resource providing navigable waterways for commerce and habitat for countless species.

The cities of Oakland and San Francisco are located across the Bay from one another, roughly midway between the northern and southern ends of the Bay. For viewers both on and off the water, the area between these two cities is particularly scenic. Four major islands (Alcatraz, Angel, Treasure, and Yerba Buena) are found in this region: Mt. Tamalpais and the hills of Marin County tower to the northwest; the East Bay hills of Oakland and Berkeley rise dramatically to the east; and the skylines of Oakland and San Francisco complement the area's natural beauty. The preservation of the aesthetic quality of this region is of particular importance to decision-makers and the millions of people who live in and visit the Bay Area each year.

Context of the East Span within the Bay Area

Along with the Golden Gate Bridge, the SFOBB is one of the Bay Area's most prominent man-made features. See Figure 3-8 in Appendix A for visual context.

The SFOBB East Span is a highly visible structure that can be seen from cities on the west side of the Bay (San Francisco, Sausalito) as well as from cities in the East Bay (including Alameda, Oakland, Berkeley, Emeryville, Albany, El Cerrito, and Richmond). For eastbound motorists, the SFOBB East Span is the gateway to Oakland and the East Bay. While motorists traveling in this direction on the existing East Span have views of

the City and Port of Oakland to the south and the hills behind the communities of Berkeley and Emeryville to the north, these views are highly obstructed by the upper deck of the bridge and the steel trusses which line the bridge.

3.3.2 Existing Landscape Units and Visual Image Types

The study area has been subdivided into "landscape units" to facilitate its description and analysis of the project. Landscape units are geographically distinct portions of the study area which have a particular visual character. In the study area, the five landscape units identified are Yerba Buena Island (YBI), the main span (cantilever section) of the existing East Span, the incline section of the East Span, the Oakland Touchdown area, and the SFOBB Toll Plaza. The boundaries of each landscape unit are shown in Figure 3-9 in Appendix A and described in Table 3.3-1. Figure 3-10a in Appendix A includes representative photographs of the landscape units.

Each landscape unit has a certain visual character based upon the land uses that comprise it. These smaller scale land uses and landforms within each landscape unit are called "visual image types." Visual image types are areas that exhibit a fairly homogeneous visual quality. The visual image types are depicted in Figures 3-10b and 3-10c in Appendix A.

Table 3.3-1 Landscape Units

Landscape Unit	Description
Yerba Buena Island (YBI)	• 57 ha (142 acres) in size, 103 m (338 ft) maximum elevation above mean sea level. • Visually, the island appears to be largely undeveloped: steep, wooded hillsides leading down to the shoreline. The existing East Span is the island's most prominent manmade feature. • Structures visible from the SFOBB East Span: USCG facilities, the observation tower, and tunnel portal. • Visual image types present on the island include residential, industrial, military, historic, and open space.
The Main Span (Cantilever Section)	• 1.6 km (1 mile) long, up to 61 m (200 ft) above mean sea level. • Composed of steel beams, grayish-silver in color, which form a zigzag pattern along either side of the roadway between the upper and lower decks. • Fashioned in a style reminiscent of a train trestle. Includes a 737-meter (2,418-foot) cantilever truss adjacent to YBI, five high truss spans of slightly more than 152 meters (500 feet) each. • Visual image types present include open space (Bay) and historic (the bridge).

Table 3.3-1 Landscape Units (Continued)

Landscape Unit	Description
The Incline Section	• 1.7 km long (1.1 miles), rising from mean sea level to meet the cantilever section at 61 m (200 ft) above mean sea level. • Connects the cantilever section of the SFOBB East Span to the Oakland Touchdown area. • Composed of steel beams, grayish-silver in color which form a zigzag pattern along either side of the roadway between the upper and lower decks. • Visual image types present include open space (Bay) and historic (the bridge).
Oakland Touchdown	• 1.6 km (1 mile) from the SFOBB Toll Plaza to where the East Span begins its incline. • Area is flat and rises only a few meters above sea level. • On the north side of the touchdown is an open area adjacent to the mudflats of the Emeryville Crescent. This area harbors several pine trees and low marshland vegetation. • On the south side of the span, industrial uses, including open storage, the EBMUD dechlorination facility, and two maintenance buildings, one once part of the historic Key System, are located at the extreme western end of the touchdown. An undeveloped area owned by the U.S. Army exists along the shoreline at the southern edge of the touchdown area. • Visual image types include industrial, historic, and open space.
SFOBB Toll Plaza	• Ground level, encompassing 15 lanes of westbound traffic. • Entirely man-altered with broad expanses of asphalt where vehicles queue to pay tolls and six lanes of eastbound traffic continuing off the bridge toward the network of highways in the East Bay. • Main Bridge Administration Building is located at the SFOBB Toll Plaza, along with a series of Caltrans maintenance and repair buildings which support the operation and maintenance of the SFOBB. • Visual image types in this landscape unit consist of military and industrial.

Source: Visual Impact Assessment, September 1998.

3.3.3 Viewer Groups and Viewpoints

Viewer groups include those viewers who can expect to see views *from* the bridge and those who can expect to see views *to* the bridge. Viewer groups are defined as those viewers most likely to share similar exposure to and expectations of their view from and to the SFOBB East Span.

Views from the Bridge

Views from the bridge are seen from motor vehicles. Viewer groups include commuters, recreational users, and commercial users.

Commuters. The flow of commuting traffic is primarily westbound (to San Francisco) during the morning period and primarily eastbound (to Oakland and surrounding communities) in the afternoon period.

Westbound traffic on the SFOBB rides on the upper deck of the bridge. Westbound views are partially obstructed by the architecture of the bridge itself, most noticeably by the presence of a 1.2-meter (4-foot) high solid railing that runs along either side of

the roadway. The construction style includes steel beams that reach from the upper deck into the cantilever structure at regular intervals, partially obstructing views from automobiles. Nevertheless, commuters have several dramatic views, including the skyline of San Francisco and the Marin Headlands, as they proceed westward.

Eastbound traffic on the SFOBB rides on the lower deck of the span. Views from the lower deck are significantly obstructed for three reasons: the presence of the westbound roadway above, the presence of a 1.2-meter (4-foot) high solid railing that lines either side of the lower span, and the presence of steel beams that span from the upper to lower deck at regular intervals. For motorists commuting in sport utility vehicles, buses, and other vehicles with a higher passenger compartment, visibility is less compromised by the solid railing and the architecture of the bridge.

Recreational Users. Recreational users of the bridge include tourists enjoying the scenery of the Bay, outdoor enthusiasts traveling to points eastward from San Francisco, and people making their way to events or gatherings outside of their working environment. All recreational users are in vehicles as there are no bicycle or pedestrian facilities on the SFOBB.

Commercial Users. Commercial users include truck drivers, delivery personnel, bus drivers, and other people involved in day-to-day commerce in the Bay Area. Commercial users might make several trips across the bridge on a daily basis. Commercial users would tend to ride in vehicles with a higher passenger compartment and so would enjoy greater visibility from the bridge.

Views to the Bridge

The viewers' experience of the bridge varies considerably based upon their location, the duration of their view, and the frequency with which they are exposed to views of the bridge. To provide a representative sample of what changes viewers across the San Francisco Bay Area would experience in their viewshed as a result of construction of a new bridge, a cross section of viewers and viewpoints was chosen. Please see Figures 4-5 through 4-15 in Appendix A for photographs of views toward the East Span.

Viewer Groups. Viewer groups identified in this section include commuters, ferry passengers, residents and workers, and recreational users/tourists.

Commuters with views to the East Span exist on both sides of the Bay. Commuters traveling on the interstate highway system in the East Bay on sections of I-80 westbound and I-880 northbound have particularly clear views and would be most sensitive to changes to the East Span.

Ferry passengers primarily include commuters between various points in the East and North Bay and San Francisco. Ferry passengers view the East Span from the Bay surface.

Residential viewers and workers exist on both sides of the Bay. Views vary greatly within this group, based on proximity, view obstruction, and the location and elevation

of the residence/workplace. Residents and workers with clear, unobstructed views would be most sensitive to changes to the East Span. In the East Bay, potential viewers may live/work in Oakland, Emeryville, Berkeley, Albany, El Cerrito, Richmond, or San Leandro. In the West Bay, potential viewers may live/work in San Francisco, Sausalito, Tiburon, or elsewhere in Marin County.

Recreational users and tourists have abundant opportunities to view the East Span from all around the Bay Area. Activities such as boating, kayaking, windsurfing, and fishing make use of the Bay itself, while activities such as sightseeing, hiking, and walking often incorporate a view of the Bay. These users would typically be very sensitive to changes to the East Span.

Existing Visual Quality. Representative viewpoints were identified and were used to simulate the proposed project alternatives. This was done to assist in the analysis and documentation of visual resource changes. The location of these viewpoints within the Bay Area is depicted in Figure 3-11 in Appendix A. Potential viewpoints were chosen on the basis of a variety of factors, including high visibility/close proximity to sensitive viewers, specific views or types of views identified as important by the public, representative of specific viewers or viewer groups, and range of view types available to the public (close proximity to long-distance views).

The existing visual quality for each of the viewpoints identified was evaluated using an approach to scenic quality evaluation that looks for indicators of the level of visual relationships rather than on a judgment of physical landscape components. This approach provides a set of three evaluative criteria developed under the sponsorship of the FHWA in previous visual impact studies: vividness, intactness, and unity.

These criteria are defined as follows:

- **Vividness** is the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns. An example within the study area is the view of the Bay and San Francisco skyline seen from the upper deck of the existing Bay Bridge;

- **Intactness** is the visual integrity of the natural and man-built landscape of the immediate environs and its freedom from encroaching elements. An example of lack of intactness within the study area is the patchwork of industrial uses on the Oakland Touchdown; and

- **Unity** is the visual coherence and compositional harmony of the viewshed. The viewshed includes all natural and man-made features found within the normal view range. In man-altered landscapes, it frequently attests to the careful design or fit of individual components in the landscape. An example is the way man-made elements such as the Golden Gate Bridge combine with natural features such as San Francisco Bay to provide a coherent image unique to the Bay Area.

The results of this analysis of existing visual quality are summarized in Table 3.3-2.

Table 3.3-2 Summary of Existing Visual Quality

Viewpoint	Setting	Vividness	Intactness	Unity
Richmond Marina	9.6 km (6 mi.) north of span. Coastal. Sea level.	Moderate-to-high	Moderate-to-high	Moderate-to-high
Berkeley Pier	4.8 km (3 mi.) northeast of span. Coastal. Sea level.	High	High	Moderate
The Claremont Hotel	8.0 (5 mi.) kilometers northeast of span. Inland. Elevated.	Low	Low-to-moderate	High
I-80 between University Ave. and Ashby Ave.	4.0 km (2.5 mi.) northeast of span (moving southbound). Inland. Sea level.	Moderate	Low-to-moderate	Low-to-moderate
Emeryville Marina	2.5 km (1.6 mi.) northeast of span. Coastal. Sea level.	Moderate	Moderate	Moderate-to-high
Oakland Touchdown Area	60 m (200 ft.) south of span. Coastal. Sea level.	High	High	High
I-880 Approaching the SFOBB	9.8 km (6 mi.) east of span at closest point (moving). Inland. Elevated.	Moderate	Low-to-moderate	Low-to-moderate
Oakland Federal Building	5.6 km (3.5 mi.) southeast of the span. Inland. Elevated.	Low-to-moderate	Moderate	Moderate-to-high
Alameda Naval Air Station	4.0 km (2.5 mi.) south of span. Inland. Sea level.	Moderate-to-high	Moderate	Moderate
Oakland-San Francisco Ferry	As close as 0.8 km (0.5 mi.) south of span (moving west-east). In the Bay. Sea level.	High	High	High
Hunters Point	10.0 km (6.3 mi.) southwest of span. Coastal. Sea level.	Moderate	Moderate-to-high	High
Potrero Hill	7.0 km (4.4 mi.) southwest of span. Inland. Elevated.	Moderate	Moderate	Moderate-to-high
Pier 39	5.0 km (3 mi.) west of span. Coastal. Sea level.	Low-to-moderate	Moderate-to-high	Moderate
Treasure Island–Viewpoint 1	0.8 km (0.5 mi.) northwest of span. Coastal. Sea level.	High	High	Moderate-to-high
Treasure Island–Viewpoint 2[a]	0.8 km (0.5 mi.) north of span. Coastal. Sea level.	High	High	Moderate-to-high
Sausalito	12.0 km (7.5 mi.) northwest of the span. Coastal. Sea level.	Moderate	Moderate-to-high	High
Angel Island	7.2 km (4.5 mi.) northwest of span. Inland. Elevated.	Moderate-to-high	Moderate	High
Vallejo-San Francisco Ferry	As close as 2.5 km (1.6 mi.) northwest of span (moving south-north). In the Bay. Sea level.	High	Moderate-to-high	High
Nimitz House, YBI[a]	Within 100 meters (328 feet) north and west of the span. The span is approximately 30 meters (98 feet) above the viewpoint.	High	Low	Low
Yerba Buena[a]	74 meters (250 feet) north of span. Forest. Historic buildings. Sea level.	High	Moderate-to-low	Moderate-to-low

Source: Visual Impact Assessment, September 1998.
[a]These viewpoints added after completion of the Visual Impact Assessment.

3.4 AIR QUALITY

The impacts of air pollution on health and other aspects of the quality of life are considered harmful by regulatory agencies such as the U.S. Environmental Protection Agency (EPA). Several federal, state, and local regulations and programs exist to protect and improve air quality in the Bay Area.

3.4.1 Regulatory Context

Federal Regulations

Pursuant to the federal Clean Air Act of 1970 and its subsequent amendments, the EPA established ambient air pollutant concentration standards and maximum allowable emission rates for certain individual sources of air pollutants. EPA made each state responsible for attaining ambient air quality standards—National Ambient Air Quality Standards (NAAQS)—within its borders. A State Implementation Plan (SIP) must be prepared that demonstrates how each state will attain the NAAQS.

NAAQS have been established for seven criteria air pollutants: ozone, carbon monoxide, particulate matter with an aerodynamic diameter less than ten micrometers (PM_{10}), particulate matter with an aerodynamic diameter less than 2.5 micrometers ($PM_{2.5}$), nitrogen oxides, lead, and sulfur dioxide. Primary standards for air pollutants were established to protect public health, while secondary standards were established to protect the public welfare by preventing impairment of visibility and damage to vegetation and property. The federal primary standards are listed in Table 3.4-1. The table also summarizes the attainment status for each criteria pollutant regulated by the EPA.

On the federal level, the Bay Area has been designated as an attainment (meeting standards) or unclassified (i.e., available data do not support a designation of non-attainment or attainment) area for all pollutants, except ozone. In June 1998, the EPA re-designated the Bay Area as non-attainment area for ozone because the area had 11 violations in 1995 and six violations in 1996. The Bay Area Air Quality Management District (BAAQMD), the local agency in charge of controlling air pollution and attaining air quality standards in the Bay Area, developed an Ozone Attainment Plan, which was adopted in June 1999. The EPA has indicated that the 1999 Ozone Attainment Plan is inadequate. As a result, the Metropolitan Transportation Commission (MTC), the Air Resources Board, and the BAAQMD are preparing a revised Ozone Attainment Plan for submittal to EPA by July 2001. The BAAQMD hopes to achieve attainment by 2003.

Under the Clean Air Act, regions that are maintenance areas (i.e., geographic areas that were previously designated non-attainment areas, but now meet the applicable standard) still must demonstrate how they will maintain compliance with the standard. The BAAQMD has prepared a Carbon Monoxide Maintenance Plan that includes information on control measures that will be used to keep the Bay Area in attainment for at least the next ten years.

In addition to other SIP and Air Quality Plan activities, federal agencies must also make a determination of conformity with the SIP before taking any action on a proposed

Table 3.4-1 State and Federal Air Quality Standards

		California Standards		National Standards	
Pollutant	**Averaging Time**	**Concentration**	**Bay Area Attainment Status[a]**	**Concentration**	**Bay Area Attainment Status**
Ozone	1-hour	0.09 ppm (180 μg/m^3)	N	0.12 ppm (235 μg/m^3)	N[b]
	8-hour[c]	---	---	0.08 ppm (157 μg/m^3)	U
Carbon Monoxide	8-hour	9.0 ppm (10 mg/m^3)	A	9 ppm (10 mg/m^3	A
	1-hour	20 ppm (23 mg/m^3)	A	35 ppm (40 mg/m^3)	A
Nitrogen Dioxide	Annual Average	---	---	0.053 ppm (100 μg/m^3)	A
	1-hour	0.25 ppm (470 μg/m^3)	A	---	---
Sulfur Dioxide	Annual Average	---	---	80 μg/m^3 (0.03 ppm)	A
	24-hour	0.04 ppm (105 μg/m^3)	A	365 μg/m^3 (0.14 ppm)	A
	1-hour	0.25 ppm (655 μg/m^3)	A	---	---
Suspended Particulate Matter (PM_{10})	Annual Arithmetic Mean	---	---	50 μg/m^3	A
	Annual Geometric Mean	30 μg/m^3	N	---	---
	24-hour	50 μg/m^3	N	150 μg/m^3	U
Suspended Particulate Matter ($PM_{2.5}$)[c]	Annual Arithmetic Mean	---	---	15 μg/m^3	U
	24-hour	---	---	65 μg/m^3	U
Lead	Calendar Quarter	---	---	1.5 μg/m^3	A
	30-Day Average	1.5 μg/m^3	A	---	---

Source: California Air Resources Board, Proposed Amendments to the Area Designations for State Ambient Air Quality Standards and Proposed Maps of the Area Designations for the State and National Ambient Air Quality Standards, October 1999.

Notes:

[a] A = Attainment. N = Non-attainment. U = Unclassified.

[b] The Bay Area was re-designated as non-attainment for ozone in June 1998.

[c] The 8-hour ozone and $PM_{2.5}$ standards were struck down by a federal court in May of 1999. EPA will appeal.

project located in a non-attainment or maintenance area. In 1993, EPA published the General Conformity Rule that indicates how federal agencies are to make such a determination. A similar rule was created to specifically address conformity issues related to highway or transit projects that receive funding or approval from FHWA or the Federal Transit Administration (FTA). The most recent version of the Transportation Conformity Rule is July 1997. In general, transportation projects must not cause or contribute to new violations of air quality standards, worsen existing violations, or interfere with timely attainment of standards. Regional transportation plans (RTPs) and transportation improvement programs (TIPs) must conform to the SIP. Individual projects must come from a conforming RTP and TIP, be included in the regional emissions analysis for the RTP and TIP, or be included in a newly performed regional analysis.

Projects must also be analyzed for their localized air quality impacts in PM_{10} and carbon monoxide non-attainment or maintenance areas. Guidance for performing PM_{10} analyses is not yet available.

State Regulations

The California Air Resources Board (CARB) coordinates and oversees the activities of California's many local air quality agencies. The CARB is also responsible for incorporating local non-attainment plans into the SIP. The CARB has established state ambient air quality standards, many of which are more stringent than the corresponding NAAQS (see Table 3.4-1 for a comparison of the standards). The CARB and the local air quality agencies operate numerous air quality monitoring stations throughout the state. Data collected at these stations are used to classify areas and air basins as attainment or non-attainment for each criteria air pollutant based on whether the federal and state standards have been achieved.

The California Clean Air Act (CCAA), which became effective on January 1, 1989, provides a planning framework for attainment of California Air Quality Standards. Local air quality agencies in violation of state ambient air quality standards are required to prepare plans for attaining the state standards.

The San Francisco Bay Area has been classified by the CARB as a serious state non-attainment area for ozone. The Bay Area 1994 Clean Air Plan included a comprehensive strategy to reduce ground-level ozone in the Bay Area. This plan was updated in 1997. The Bay Area 1997 Clean Air Plan includes changes in the organization and scheduling of some of the 1994 Clean Air Plan control measures and also includes 12 new stationary and mobile source control measures, as well as two new transportation control measures.

The Bay Area also does not attain state PM_{10} ambient air quality standards, but attainment programs for PM_{10} are not yet required. The California Legislature, when it passed the California Clean Air Act in 1988, recognized that PM_{10} attainment could not be easily obtained. The CCAA did require the CARB to produce a report regarding the prospect of achieving the state ambient air quality standard for PM_{10}. The CARB recommended that certain actions be taken, but did not impose a planning process to require attainment by a certain date.

3.4.2 Meteorology and Topography

The primary factors affecting local air quality are the locations of air pollutant sources and the amounts of pollutants emitted, but meteorological and topographical conditions also are important. Atmospheric conditions such as wind speed, wind direction, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. Another important factor is the Pacific Ocean, which moderates temperatures and helps create consistent wind gradients.

The San Francisco Bay Area has complex terrain, relatively strong prevailing winds because of its proximity to the Pacific Ocean, and strong temperature gradients between the coast and inland areas. Consequently, the Bay Area has low potential for accumulation of pollutants near the coast and high potential in sheltered inland valleys. The project is in an area where pollution potential is very low due largely to good ventilation and less influx of pollutants from upwind sources. However, on occasion, the area does experience warm temperatures, calm winds, and pollutant stagnation.

3.4.3 Existing Project Area Air Quality

Monitoring data in the project area are limited. The criteria pollutant monitoring stations closest to the project site are located on Alice Street (near Jack London Square) in Oakland and at the county hospital in San Leandro. Monitored values at these stations may be slightly higher than actual concentrations in the project area, since there are so few pollutant sources near the SFOBB. The Alice Street station measures ozone and carbon monoxide and the San Leandro station measures for ozone and PM_{10}. Table 3.4-2 summarizes recent monitoring data from these two stations[16].

The monitoring data for 1995 through 1998 show that the area occasionally violates state ozone and 24-hour PM_{10} standards and, even more rarely, exceeds the federal ozone standard. The Oakland station monitored only one state ozone violation during the four years examined. During the same four years, the San Leandro station had 13 violations of the state ozone standard and three violations of the federal standard. The California 24-hour PM_{10} standard was exceeded twice. All other pollutant levels were below federal and state standards.

[16] California Air Resources Board, *Summary of Air Quality Data* for each of the years 1995, 1996, 1997, and 1998, published in 1996, 1997, 1998, and 1999, respectively.

Table 3.4-2 Air Pollutant Data Summary (1995-1998)

		Year			
		1995	**1996**	**1997**	**1998**
Pollutant	**Averaging Time**	Concentration (ppm)	Concentration (ppm)	Concentration (ppm)	Concentration (ppm)
Ozone	1-hour (O)[a] (SL)[a]	0.11[c] 0.15	0.09 0.11	0.08 0.11	0.06 0.11
Carbon Monoxide	8-hour (O)	3.9	3.9	3.6	4.6
	1-hour (O)	5.0	7.0	8.0	6.0
Suspended Particulate Matter (PM_{10})[b]	Annual Arithmetic Mean (SL)	19.5	21.3	17.4	14.0
	Annual Geometric Mean (SL)	16.9	19.1	15.9	13.2
	24-hour (SL)	47	59	65	32

Source: California Air Resources Board (1996, 1997, 1998, and 1999)

a (O) = Oakland Alice Street monitoring station.
(SL) = San Leandro County Hospital monitoring station.

b Units of measurement for PM_{10} are $\mu g/m^3$ (micrograms per cubic meter).

c Underline indicates exceedance of standard.

3.5 NOISE AND VIBRATION

This section describes the affected environment for noise and vibration. It discusses how noise and vibration are measured and reported, criteria for assessing noise levels, and measured and modeled noise and vibration levels at Yerba Buena Island (YBI), Treasure Island (TI), and along the Oakland shoreline. A detailed Noise and Vibration Study technical report has been prepared and is available for review at the locations indicated in the Preface.

3.5.1 Noise

Perception of Noise and Noise Descriptors

A number of factors affect sound as it is perceived by the human ear. These include the actual level of sound (or noise), the frequencies involved, the period of exposure to the noise, the changes or fluctuations in the noise levels during exposure, and meteorological conditions (wind speed, direction, inversions, humidity, etc.). Levels of noise are measured in units called decibels (dB). Since the human ear cannot perceive all pitches or frequencies equally well, measured sound levels are adjusted or weighted to correspond to human hearing. This adjusted unit is known as the "A-weighted" decibel. All references to noise in this report refer to A-weighted decibel levels, or dBA. A few examples of dBA noise levels are 40 dBA (typical of quiet urban nighttime), 88 dBA (typical of a diesel truck passing by at 15 meters [50 feet]), and 105 dBA (typical of a jet flying over at 305 meters [1,000 feet]).

Very few noises are constant. Most fluctuate in decibel level over short periods of time. One way of describing fluctuating sound is to report the fluctuating noise heard over a specific time period as if it had been a steady, unchanging sound. For this, a descriptor called the Equivalent Sound Level, L_{eq}, is computed. L_{eq} is the constant sound level (A-weighted) that, for a given situation and period (e.g., 1-hour L_{eq} or 24-hour L_{eq}), conveys the same sound energy as the actual time-varying sound. The 1-hour L_{eq} during the noisiest hour is often used to determine if a traffic noise impact exists and to determine abatement measures for roadway noise, while 24-hour cumulative L_{eq} averaging methods are used to evaluate typical noise exposure in an area.

Traffic Noise

Roadway noise is dependent on many factors: vehicle type and speed, number of vehicles, roadway surface and gradient, distance from the roadway to the receiver, ground surface (whether hard or soft), and shielding due to structures, soundwalls, hills, the edge of a roadway, and earth berms between a receiver and the road. For example, increases in vehicle speed and/or traffic will increase the noise level.

Roadway surface and gradient will also affect traffic noise. Noise from rough and potholed surfaces can be three to four dBA higher than smooth seal-coated surfaces. A steeper road gradient will primarily affect the level of truck traffic noise. The SFOBB generates higher noise levels than a typical roadway, due to the reverberation of sound and vibration within the bridge structure, and the reflection of noise from the upper deck.

Evaluating Noise Levels

Noise impacts from operation of a roadway usually assessed by evaluating the total predicted noise level and evaluating differences between the existing and future noise environments. When evaluating operational noise increases in the environment, the following relationships to quantifiable increases are used as a basis for assessing impacts:

- Except during carefully controlled laboratory conditions, a change of 1 dBA is very difficult to perceive;
- In the outside environment, a 3 dBA change is considered barely noticeable;
- An increase of 5 dBA is readily perceived as "louder" and is generally required before a change in community response would be expected;
- A 10 dBA increase is perceived as a doubling of noise; and
- Caltrans defines an increase of 12 dBA as a "substantial increase."

3.5.2 Land Uses and Noise- and Vibration-sensitive Receptors

Although the majority of the project area is located over Bay waters, the existing and proposed bridge alternatives cross or are near a variety of existing and future land uses, with varying degrees of noise and vibration sensitivity. These are briefly summarized below.

Yerba Buena Island

The U.S. Navy (Navy) and the U.S. Coast Guard (USCG) have former and existing residential units on YBI. These include the Navy's residential Quarters 1 through 7, apartment buildings containing about 105 housing units, and the USCG's enlisted and officers' quarters. The USCG also maintains various offices, maintenance and repair facilities, and outdoor tennis, basketball, and volleyball courts. These existing uses are currently exposed to noise from the existing bridge traffic. Conceptual plans for YBI outlined in the 1996 Draft Reuse Plan anticipate use of the area by the City and County of San Francisco (CCSF) for residential uses, visitor-serving attractions, conference facilities, and open space. The USCG proposes to continue existing uses.

Treasure Island

The northwestern portion of TI was developed for residential uses and includes recreational facilities such as ball fields, tennis courts, a golf driving range, and picnic areas. The eastern and southern portions of the island include administrative uses, and two of the buildings are currently used for film production. There is an existing recreational marina. Future land use plans outlined in the 1996 Draft Reuse Plan, while not defined in great detail to date, include entertainment and visitor attraction facilities; film production and industrial use facilities; hotel, resort, and conference center uses; and potential residential and research and development uses.

Oakland Touchdown Area

This location currently has no noise-sensitive activities or uses. Currently, there are no formal public access facilities to the shoreline, although the area is used informally for fishing and shoreline viewing. The City of Oakland and the East Bay Regional Park District (EBRPD) are planning the Gateway Park and public access facilities on the south side of the Oakland Touchdown. In addition, public access, in the form of bicycle and pedestrian access and viewing areas, is required in this area as a result of previous Caltrans project commitments under BCDC Permit 11-93.

3.5.3 Noise Abatement Criteria and Analysis Guidelines

Federal Highway Administration (FHWA) Noise Abatement Criteria (NAC) for various land use ratings (called activity categories) are given in Table 3.5-1. These noise criteria are assigned to both exterior and interior activities. Noise attenuation provided by most residential structures leads to compliance with the interior NAC if the exterior criterion is attained.[17]

Table 3.5-1 Federal Noise Abatement Criteria, Hourly A-Weighted Sound Level - Decibels (dBA)[a]

Activity Category	$L_{eq}^{(h)}$	$L_{10}^{(h)}$	Description of Activity Category
A	57 (Exterior)	60 (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 continue to serve its intended purpose.
B	67 (Exterior)	70 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	75 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	--	Undeveloped lands.
E	52 (Interior)	55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: Federal Highway Administration, 1982.
[a] Either $L_{10}^{(h)}$ or $L_{eq}^{(h)}$, but not both, may be used on a project.

Land uses in the vicinity of the Oakland Touchdown area include industrial and port-related sites, open space, wildlife habitat, and a future public shoreline park. There are

[17] Federal Highway Administration, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, 1982.

currently no formal public access or recreation areas, so the land uses have been classified as Activity Category C. At YBI, land uses include residences, government offices and buildings, currently unused buildings, and open space. Land uses on YBI are classified as Category B, except the government offices and buildings which are Category C. Commercial uses are present on TI and are classified as Category C. These land uses and exterior NAC correspond to the following FHWA activity categories (exterior uses), according to Table 3.5-1:

- Category B (67 dBA) - Residences, parks, and recreation areas;
- Category C (72 dBA) - Developed lands not included in Category B; and
- Category D (No NAC) - Undeveloped lands.

As described in more detail in Section 4.5 — Noise and Vibration, if these sound levels are predicted to be approached (one dBA below the criteria) or exceeded during the noisiest one-hour period, or if the project will result in a substantial (12 decibels or greater) noise increase, noise abatement measures are to be considered and, if found reasonable and feasible, they are incorporated in the project. A first step in the determination of whether future noise levels will approach or exceed the criteria is to measure noise levels and use this data to establish baseline conditions and calibrate the noise model.

3.5.4 Noise and Vibration Measurements, Model Calibration, and Noise Modeling

The existing noise environment was characterized through the evaluation of field noise measurements. Long-term measurements (at least 24 hours) were made at representative locations (see Figures 3-12 through 3-14 in Appendix A). These locations included the Navy Senior Officers' Quarters Historic District Building 240, the USCG officers' quarters, and USCG Bachelor Enlisted Quarters. A long-term measurement was also made on the north side of the bridge at the Oakland Touchdown area. Thirty-eight short-term measurements (approximately 15 minutes long) were also made at representative locations and land uses. These included residential locations, the USCG administrative offices, Building 262, the film studios on TI, and the location of the proposed Oakland Touchdown park. The short-term and long-term measurements were used to calibrate the noise model, providing more accurate modeling of existing and future noise levels generated by traffic.

Future peak-hour noise levels were predicted using the "Sound32" noise model. This model is based on the FHWA noise prediction model STAMINA and uses California Vehicle Noise Emission Levels. Traffic data were developed for the model based on volumes and speed scenarios that would create the loudest hourly peak noise levels. Each scenario was tested, and the "worst-case" traffic speed and volume condition (i.e., 1,600 vehicles per lane per hour traveling at 97 kilometers [60 miles] per hour) was selected for further modeling that created the maximum predicted noise conditions.

Measurements of existing vibration were made at five locations: two on YBI (on the base of a bridge support column [Bent YB3] south of Building 213 and at a point approximately 30 meters [100 feet] north of the bridge column support) and three on TI (4 meters [13 feet] from the shoreline; approximately 23 meters [76 feet] from the film studios on a concrete pillar used as a foundation for metal lattice which appears to have supported a sun/rain cover; and on a large steel manhole cover about 23 meters [76 feet] south of the film studios).

3.5.5 Existing Noise Levels

Generally, the field measurements indicated noise levels in excess of 66 dBA L_{eq} along and near most of the project route. Based on the measured noise levels, noise modeling was performed to predict the highest noise period and level for the peak-noise-hour traffic conditions for the existing bridge. The following is a summary of the results by geographical area. Table 3.5-2 summarizes the results of the long-term (24-hour) noise measurements. Table 3.5-3 lists the measured short-term (generally 10 to 15 minutes in duration) noise levels, while modeled noise levels for the existing bridge and setting are shown in Table 3.5-4. The data in Table 3.5-4 represent the traffic noise during the peak-noise hour using Level-of-Service C-D traffic volumes and speeds (1,600 vehicles per hour per lane traveling at 97 kilometers [60 miles] per hour). The locations of measured and modeled receptors are shown in Figures 3-12 through 3-14 in Appendix A.

Yerba Buena Island

All of the noise measurements conducted on YBI approached or exceeded the FHWA NAC for Activity Category B (residences, parks, recreation areas) of 67 dBA L_{eq}, with the exception of the noise measurements taken at the USCG Officers' Quarters (Quarters A, B, and C), located south of the bridge and west of the existing Coast Guard station. At that location, noise levels ranged from 60 dBA L_{eq} to 62 dBA L_{eq}. Elsewhere, noise levels ranged from 66 dBA L_{eq} to 74 dBA L_{eq}. These noise levels were verified by repeating the measurement one or more times at selected locations. 24-hour noise measurements at YBI ranged from 59 dBA (24-hour L_{eq}) at Location 5 to 72 dBA (24-hour L_{eq}) at Location 1.

Consistent with the measurements, the noise modeling also showed existing peak noise levels that would exceed the NAC for residential locations (Table 3.5-4). Non-residential land uses, such as the USCG administrative complex, have a NAC of 72 dBA (for Category C land uses). The existing peak-noise-hour level at Location 7 was modeled at 69 to 71 dBA and thus would approach the criteria under worst-case conditions.

The measured and modeled noise levels are primarily generated by traffic on the existing bridge structure. Specifically, the stacked configuration of the bridge causes traffic noise from the lower deck to be reflected from the upper deck underside, and traffic noise components from both the upper and lower decks are also transmitted downward. The expansion joints in the existing bridge structure were observed to cause additional noise as traffic passes over them, because of discontinuities with the roadway surface. Vibration is carried by the joints through the steel superstructure, resulting in the whole structure vibrating and causing noise.

Treasure Island

A noise measurement was conducted in the parking lot of a film studio located on TI (see Figure 3-13 in Appendix A). This site overlooks the East Span, which is approximately 760 meters (2,500 feet) south of the studio. The measured noise level was 62 dBA L_{eq} at this location, and the noise model indicated the peak-noise-hour level to be 67 dBA L_{eq}. These levels are below the NAC for Activity Category C of 72 dBA L_{eq}.

Oakland Touchdown Area

Measured noise levels in the vicinity of the Oakland Touchdown area ranged from 64 to 71 dBA L_{eq}. Modeling of peak-noise-hour traffic conditions indicated levels of 65 to 74 dBA with five of the noise receptors modeled (noise receptors 12-M2, 12-LT, 13A, 13C, and 3-M1 in Table 3.5-4) exceeding the NAC for Activity Category C (the prevalent land use in this area, along with Activity Category D) of 72 dBA L_{eq}. A 24-hour noise measurement conducted at Location 12 resulted in a 24-hour L_{eq} of 71 dBA as seen in Table 3.5-2.

TABLE 3.5-2: Long-Term Noise Measurement Data Summary

Location	Activity Category	Date	24-Hour L_{eq}(dBA)	Peak-Hour L_{eq}(dBA)
1-LT: YBI, Location 1	B	2/9/98	72	74
2-LT: YBI, Location 2	B	2/9/98	69	72
5-LT: YBI, Location 5	B	2/10/98	59	65
6-LT: YBI, Location 6	B	2/11/98	70	76
12-LT: OT, Location 12	D	2/11/98	71	73

Source: Noise and Vibration Study, September 1998.

3.5.6 Existing Measured Vibrations

Vibration measurements were made at five locations: at and near the bridge columns on YBI and at several points on TI. Short-term measurements were made during freely flowing traffic conditions to obtain representative vibration levels. At the base of the bridge column, the measured vertical peak vibration velocity included background (0.007 centimeter per second [0.003 inch per second]), wind induced (0.01 to 0.02 centimeter per second [0.006-0.007 inch per second]), and truck-related (0.03 centimeter per second [0.01 inch per second]) vibration. The peak vibration velocity measured at a distance of 30 meters (100 feet) from the bridge column included background (0.006 centimeter per second [0.002 inch per second]) and truck-related (0.02 centimeter per second [0.009 inch per second]) vibration. The measurements indicated that heavy-duty trucks crossing the bridge were the primary sources of vibration in the immediate vicinity of the bridge structure.

However, on TI (where film studios are located), measured vibration levels (0.001 to 0.02 centimeter per second [0.0005 to 0.007 inch per second]) were primarily associated with wind and wave action at the shoreline. There was no observed correlation between the

measured vibration near the film studios on TI and heavy truck traffic on the SFOBB. It should be noted that the human threshold of perception to continuous vibrations is 0.015 to 0.030 centimeter per second (0.006 to 0.019 inch per second). It is unlikely that the levels measured near the film studios are perceptible by humans. The vibration thresholds for film studio equipment may be lower than the threshold for human perception. It is assumed that the current level of vibration at the film studios is acceptable to the operators of the studios and does not hinder operations.

Table 3.5-3: Short-Term Noise Measurement Data Summary (Page 1 of 2)

		Measurement Period			Measurement Results
Measurement Location[a]	**Measurement Type**	**Date (month/ day/yr.)**	**Start Time (hr:min)**	**Duration (min:sec)**	**L_{eq}(dBA)**
Site 1A: YBI: On sidewalk between Bldgs. 1 and 2 adjacent to fire hydrant.	I-80 Traffic Noise	2/9/98	13:55	15:00	69
Site 1B: YBI: Same as 1A.	I-80 Traffic Noise	2/10/98	13:45	15:00	71
Site 1C: YBI: In center of grassy knoll west of Bldg. 4.	I-80 Traffic Noise	2/9/98	14:17	15:00	66
Site 1D: YBI: Same as 1C.	I-80 Traffic Noise	2/10/98	13:15	15:00	68
Site 2A: YBI: 10 feet north of edge of bluff approx. 35' south of bldg.	I-80 Traffic Noise	2/9/98	11:30	15:00	71
Site 2B: YBI: Same as 2A.	I-80 Traffic Noise	2/9/98	11:45	15:00	71
Site 2C: YBI: Same as 2A.	I-80 Traffic Noise	2/10/98	14:55	15:00	71
Site 3A: YBI: 8' north of garage of Bldg. 267. View of lower deck of I-80.	I-80 Traffic Noise	2/9/98	12:30	15:00	71
Site 4A: YBI: Front porch of Quarters 8.	I-80 Traffic Noise	2/11/98	17:30	10:00	70
Site 4B: YBI: Same as 4A.	I-80 Traffic Noise	2/12/98	10:30	10:00	70
Site 5A: YBI: 10' east of Facade of Quarters "B".	I-80 Traffic Noise	2/10/98	12:30	15:00	62
Site 5B: YBI: Same as 5A.	I-80 Traffic Noise	2/11/98	12:45	15:00	61
Site 5C: YBI: In front of Quarters "C" ~ 100' from Site 5A.	I-80 Traffic Noise	2/11/98	13:02	10:00	61
Site 5D: YBI: @ Quarters A (southeast of quarters B & C).	Aircraft & Local Ambient (I-80 noise is low)	2/11/98	12:45	15:00	60
Site 6A: YBI: ~ 1' from 6-LT location @ SW side of basketball court, north of USCG housing.	I-80 Traffic Noise	2/11/98	14:15	15:00	69
Site 6C: YBI: In center of grassy area surrounded by USCG housing.	I-80 Traffic Noise	2/11/98	15:00	15:00	68
Site 7A: YBI: USCG admin bldgs. north side facing the bridge.	I-80 Traffic Noise	2/11/98	17:05	5:00	67
Site 7B: YBI: Same as 7A.	I-80 Traffic Noise	2/11/98	17:15	5:00	67
Site 9A: YBI: In parking lot of Bldg. 213.	I-80 Traffic Noise	2/9/98	16:50	15:00	73
Site 9B: YBI: Same as 9A.	I-80 Traffic Noise	2/11/98	16:00	10:00	73

Note: YBI=Yerba Buena Island; OT=Oakland Touchdown Area; TI=Treasure Island; 1'=0.3048 m
[a] All measurement locations on YBI are classified as Activity Category B, except locations 7A and 7B which are Category C. Locations on the Oakland Touchdown area and TI are classified as Category C.

Table 3.5-3: Short-Term Noise Measurement Data Summary (Page 2 of 2)

		Measurement Period			Measurement Results
Measurement Location[a]	**Measurement Type**	**Date (month/ day/yr.)**	**Start Time (hr:min)**	**Duration (min:sec)**	**L_{eq}(dBA)**
Site 10A: YBI: Just south of Bldg. 262, (old torpedo factory).	I-80 Traffic Noise	2/9/98	17:30	15:00	74
Site 10B: YBI: Same as 10A.	I-80 Traffic Noise	2/11/98	16:47	5:00	74
Site 11A: YBI: @ tennis courts north of USCG housing.	I-80 Traffic Noise	2/11/98	14:35	15:00	71
Site 11C: YBI: In lot just south of Bldg. 40 (sea cadets residence).	I-80 Traffic Noise	2/11/98	14:50	15:00	73
Site 12A: OT: halfway out on rounded promontory.	I-80 Traffic Noise	2/11/98	11:50	10:00	70
Site 12C: OT: ~ 1 foot from LT location	I-80 Traffic Noise	2/11/98	12:00	15:00	71
Site 13A: OT: 50 feet east of cable station; 25 feet west of end of paved road.	I-80 Traffic Noise	2/11/98	10:10	15:00	70
Site 13C: OT: At fence line near promontory, 10' east of EBMUD chem. treatment bldg.	I-80 Traffic Noise	2/11/98	10:38	15:00	71
Site 17A: OT: ~ 60' from west side of radio bldg., near rear facade line.	I-80 Traffic Noise	2/13/98	11:00	15:00	64
Site 17B: OT: Same as 17A.	I-80 Traffic Noise	2/13/98	11:15	6:00	64
Site 18A: OT: 15 feet north of power pole and 100 feet east of cellular site.	I-80 Traffic Noise	2/11/98	11:00	15:00	65
Site 20A: YBI: Center of field.	I-80 Traffic Noise	2/11/98	16:15	6:00	69
Site 21A: YBI: @ fire hydrant H-44 near edge of bluff, bridge overhead.	I-80 Traffic Noise	2/11/98	16:30	10:00	71
Film Studio: TI: ~ 40 feet south of studio bldg., in parking lot facing bridge.	I-80 Traffic Noise, aircraft	2/12/98	14:00	10:00	62

Note: YBI=Yerba Buena Island; OT=Oakland Touchdown Area; TI=Treasure Island; 1'=0.3048 m
[a] All measurement locations on YBI are classified as Activity Category B, except locations 7A and 7B which are Category C. Locations on the Oakland Touchdown area and TI are classified as Category C.
Source: Noise and Vibration Study, September 1998.

Table 3.5-4: Summary Of Existing Modeled Peak-Noise-Hour Noise Levels

Location #	Noise Receptor	Existing Modeled Peak-Noise-Hour Noise Level L_{eq} (dBA)
1	1A	72
	1C	70
	1-LT	71
	1-M1	74
	1-M2	70
	1-M3	69
	1-M4	70
	1-M5	75
2	2A	74
	2-M1	71
3	3A	75
4	4A	72
5	5A	66
	5C	64
	5D	64
	5-M1	67
6	6A	72
	6C	71
	6-M1	72
	6-M2	72
7	7A	69
	7-M1	71
9	9A	76
	9-M1	76
10	10A	77
	10-M1	77
11	11A	75
	11C	77
	11-M1	77
	11-M2	77
	11-M3	77
12	12A	72
	12-M1	71
	12-M2	74
	12-LT	73
13	13A	73
	13C	74
	13-M1	73
	13-M2	71
	13-M3	71
17	17A	66
	17-M1	70
18	18A	69
	18-M1	66
	18-M2	65
20	20A	72
	20-M1	72
21	21A	74
	21-M1	73
	21-M2	73
	21-M3	73
	STUDIO	67

Note: All measurement locations on YBI are classified as Activity Category B, except locations 7A and 7B which are Category C. Locations on the Oakland Touchdown area and TI are classified as Category C.
Source: Noise and Vibration Study, September 1998.

3.6 HAZARDOUS WASTES

A Hazardous Wastes Assessment was conducted for the East Span Project to identify potential contaminant sources within and adjacent to the project area that may affect design and construction of the project. The assessment is available for review at the locations indicated in the Preface. For purposes of this assessment, hazardous wastes or materials include hazardous substances as regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), hazardous wastes as regulated under the Resource Conservation and Recovery Act of 1976 (RCRA), and the California Hazardous Waste Control Law (HWCL), and other wastes regulated under federal, state, and local regulations. Information in regard to sampling and analysis of sediments that would be dredged as part of the East Span Project is presented in Section 3.12.2 — Sediment Sampling and Analysis.

3.6.1 Legal and Regulatory Requirements

The following presents an overview of the major laws and regulations that apply to hazardous waste of the East Span Project.

- The CERCLA or Superfund, as amended by the Superfund Amendments and Reauthorization Act (SARA), was originally passed in 1980. CERCLA created national policies and procedures to identify and remediate sites previously contaminated by the release of hazardous substances. These laws have the effect of holding past and present owners of real property liable for the costs of site investigations and remediation associated with environmental contamination regardless of whether the current owner was responsible for the contamination.

- The RCRA regulates hazardous waste storage, treatment, and disposal sites. The State of California implements the RCRA requirements under authorization from the federal EPA through enforcement of the California Hazardous Waste Control Law, which provides regulations that equal or exceed the federal standards.

- Other potentially relevant environmental laws and regulations include:

  - Clean Water Act (CWA);
  - Toxic Substance Control Act (TSCA);
  - Clean Air Act (CAA);
  - National Emission Standards for Hazardous Air Pollutants (NESHAPS); and
  - Various state environmental laws and regulations

In the project area, the State Water Quality Control Board, San Francisco Bay Region, administers federal, state, and local regulations for cleanup of affected surface water, groundwater, and soils that present a threat to water quality. However, the California Department of Toxic Substances Control (DTSC) has taken responsibility for regulatory oversight of several of the cleanup actions on YBI. The California Occupational Safety and Health Agency (CalOSHA) has supervisory authority over hazardous substance and waste handling by workers during construction.

3.6.2 Existing Data Review

A review of the existing hazardous wastes reports and data was conducted to identify known or potential hazardous waste concerns that may be affected by the East Span Project alternatives. A summary of these reports can be found in the Hazardous Wastes Assessment.

3.6.3 Regulatory Database Search

Publicly available federal and state environmental databases were reviewed to obtain information on the location of potential sites of environmental concern that may adversely affect the project. These sites include registered underground storage tanks (USTs) and leaking underground storage tanks (LUSTs); facilities that use, generate, treat, or dispose of hazardous wastes and/or substances; transporters of hazardous wastes; solid waste landfill sites; and unauthorized spills and releases of regulated substances.

The database search area encompassed a distance that extended from 0.8 to 1.6 kilometers (0.5 to 1 mile) on either side of the project area, depending on the type of database listing. Databases reviewed for this report are described in the Hazardous Wastes Assessment.

3.6.4 Historical Information Update and Site Reconnaissance

An evaluation of historical land uses and land use changes in the project area was conducted to identify potential historical contaminant sources. This update included interviews with environmental specialists and current property owners, as well as a historical photographic review.

A site reconnaissance in the project area and vicinity was completed to identify and confirm potential contaminant sources identified in earlier data reviews and to identify potential unreported contaminant sources.

3.6.5 Potential Sources of Contamination

Potential contaminant sources that were identified through the existing data review were screened to determine their potential to conflict with the project based on the following criteria:

- The occurrence of a documented release based on either public records or physical observation;
- The physical, chemical, and toxicological characteristics of suspected contaminants released and the media potentially affected (soil, water, and air);
- Distance from the project area;

- Nature of proposed design and construction activities in relation to the location and possible impact from a potential contaminant source; and

- Estimated groundwater flow direction and depth.

These criteria were used to eliminate potential sources that were unlikely to conflict with the project. Potential contaminant sources not eliminated during this screening process were recommended for further evaluation.

Table 3.6-1 lists potential contaminant sites on YBI and Table 3.6-2 summarizes the findings of the Oakland Touchdown area hazardous wastes assessment. Figures 3-15a and 3-15b in Appendix A show the locations of known or potential contaminant sources for YBI and the Oakland Touchdown area, respectively. The Navy occupies a significant portion of the project area on YBI. The Navy, as part of an Installation Restoration Program (IRP) for Naval Station Treasure Island (NSTI), established a Federal Facility Remediation Agreement among the Navy, the DTSC, and the San Francisco Bay Regional Water Quality Control Board (RWQCB). Under this agreement, the Navy agreed to undertake and report on specified tasks associated with environmental assessment and response actions at 25 Installation Restoration (IR) sites under the IRP in accordance with CERCLA. Some of the IR sites are located on land transferred in October 2000 by FHWA from the Navy to Caltrans. With regard to those sites and subject to construction and safety considerations, Caltrans will provide access to the Navy for purposes of performing further testing and/or remediation.

Two of the potential contaminant sites are on the former Oakland Army Base, which is located in a highly industrialized area. Property adjacent to the former Oakland Army Base is used as a maritime shipping facility. An environmental baseline study has been conducted to document the physical condition of the former Oakland Army Base property resulting from the use, storage, and disposal of hazardous substances and petroleum products during the base's history.[18] It was recommended that further investigation be conducted in the area around Burma Road and the south side of the spit to determine the source and vertical and horizontal extent of the previously detected contamination.

In addition to the contaminant sites listed in Tables 3.6-1 and 3.6-2, lead contamination due to vehicle exhaust emissions of leaded gasoline can exist in materials next to freeways constructed prior to the ban of such fuels. In some locations, this contamination has been found at concentrations that are a potential hazard to human health and the environment if not handled correctly. The California Environmental Protection Agency, DTSC, has performed a health risk assessment of this material to determine its potential hazards and how these hazards can be reduced. As a result, DTSC granted Caltrans a variance to hazardous waste regulations that allows reuse of this material within the highway right of way under specific conditions.

[18] Foster Wheeler, Inc., *Basewide Preliminary Assessment/Site Inspection (PA/SI) Oakland Army Base, Oakland, California*, Vol. I and II, February 1998.

Table 3.6-1 Known and Potential Contaminant Sources - (Yerba Buena Island)

Source Area	Identified Contaminants
IR 8 – Former Sludge Disposal Area	Surface soil contamination from metals (beryllium and lead) and from pesticides.
IR 11 – Former Landfill	Soil/Fill contamination from pesticides, metals, and petroleum hydrocarbons. Groundwater contamination from metals and petroleum hydrocarbons.
IR 13, Section E – Storm Water Off-shore Sediments	Contamination from storm water discharges. Off-shore sampling complete for Phase II Ecological Risk Assessment (analysis results pending).
IR 29 – East Side Contaminated Bridge Soils	Lead contamination of near-surface soils. Petroleum hydrocarbons detected in soil at select locations.
Building 204/208 LUST Site (both buildings have been demolished)	Petroleum hydrocarbon contamination from former gas station and adjacent fire station.
Building 270 LUST Site	Petroleum hydrocarbon contamination from active LUST site. Additional subsurface investigation pending.
Building 40 LUST Site	Petroleum hydrocarbon in groundwater. Possible upgradient (Site 270) source.
Fuel Delivery Lines near Building 213	Removal report documenting soil contamination from petroleum hydrocarbons and analytical testing is pending.
SFOBB Structure	Lead-based paint and asbestos.
Buildings to be demolished	Potential for lead-based paint and asbestos.

Source: Hazardous Wastes Assessment, 1998.

Table 3.6-2 Known and Potential Contaminant Sources - Oakland Touchdown Area

Source Area	Contaminant
Bridge footings in eastern approach area	Soil: TRPH, PAHs, Pesticides, PCBs, and Pb Groundwater: TRPH, Sb, Cd, Cr, Ni, Ag, and Ti
Army Site #1 – western end of Burma Road in Parcel 1	Soil: TPH as motor oil, and PCE
Army Site #2 – 456 m (1,500 ft) east of west end of Burma Road in Parcel 1	Soil: TPH as motor oil
Caltrans Maintenance Facility and undeveloped median area	Soil: PCBs, TPH, Pb, and VOCs Groundwater: TPH, dissolved Pb, Sb, and Cr Structure: Lead-based paint and asbestos
EBMUD Dechlorination Facility	Soil: Sodium Bisulfide
Former Landfill Area (southeast)	Soil: TPH, VOCs, SVOCs, and Pb Groundwater: TPH and SVOCs
SFOBB Structure	Lead-based paint and asbestos

Ag = Silver
Cd = Cadmium
Cr = Chromium
Ni = Nickel
PAHs = Polyaromatic Hydrocarbons
Pb = Lead
PCBs = Polychlorinated Biphenyl
PCE = Tetrachloroethene
Sb = Antimony
SVOC = Semi-Volatile Organic Compound
Ti = Titanium
TPH = Total Petroleum Hydrocarbons
TRPH = Total Recoverable Petroleum Hydrocarbons
VOC = Volatile Organic Compound

Source: Hazardous Wastes Assessment, 1998

3.7 GEOLOGY, SOILS, AND SEISMICITY

3.7.1 Regional Geologic Setting

The project is located in the Coast Ranges geologic/geomorphic province of central and northern California. The Coast Ranges province extends from approximately 500 kilometers (300 miles) south and 400 kilometers (250 miles) north of the project site. The Coast Ranges province is bordered to the north by the Klamath Mountains, to the south by the Transverse Ranges province, to the west by the Pacific Ocean, and to the east by the Great Valley province.

The Coast Ranges have a general northwest orientation and are characterized by north-northwest trending folds and faults. The province consists of sedimentary, metamorphic, volcanic, and igneous rocks ranging in age from the Jurassic/Cretaceous age (100 to 200 million years ago) to the present.

The San Francisco Bay region is located within a northwesterly oriented geomorphic depression called the San Francisco Bay-Santa Clara Valley depression. This depression and its surrounding mountains all have relatively recent tectonic origin. Formation began about one million years ago (within the Quaternary age). The sea level has fluctuated significantly several times prior to and during Holocene times, and sediments known as Bay mud have been and are currently being deposited under estuarine conditions. The Bay mud consists of unconsolidated to moderately consolidated, saturated, organic-rich silty marine clays. (See Figure 3-16 in Appendix A for a geologic profile of the project area.)

3.7.2 Regional Seismic Setting and Seismicity

The San Francisco Bay Area is one of the more seismically active regions of California. There are at least seven active faults (San Andreas, Hayward, Rodgers Creek, Calaveras, Green Valley, Concord, and Franklin) within 50 kilometers (31 miles) of the project area. The active faults trend northwesterly and display a similar right-lateral, primarily horizontal movement. These faults have generated large historical earthquakes resulting in major surface disturbances, and segments of these faults have been designated as Special Earthquake Fault Zones by the California Division of Mines and Geology (Earthquake Fault Zoning Act). Numerous other smaller active faults are present throughout the region, but are farther from the project area and not believed to be capable of causing significant earthquake shaking within the project area.

The project area's main geologic structures are associated with two major faults: the San Andreas fault about 14 kilometers (9 miles) to the west and the Hayward fault, which is located about 8 kilometers (5 miles) to the east of the study area. Both faults have had large historic earthquakes. Earthquakes on the San Andreas fault include the

7.8 magnitude[19] (Richter Scale) earthquake on April 18, 1906, and the 7.1 magnitude (Richter Scale) Loma Prieta earthquake on October 17, 1989. These earthquakes caused widespread damage throughout the greater San Francisco Bay Area. The Hayward fault has long been documented as active, with major earthquakes in 1836 and 1868. A maximum credible earthquake (MCE) is the largest earthquake reasonably capable of occurring based on current geological knowledge. The MCE has been estimated for the San Andreas fault at 8 and 7-1/4 on the Hayward fault.

3.7.3 Geology and Geotechnical Conditions in the Project Area

Yerba Buena Island

YBI is a naturally occurring island approximately 57 hectares (142 acres) in size. The change in topography of the island is extreme, with steep slopes over short distances. The elevations range from 103 meters (338 feet) near the center of the island to sea level. Slopes range from 5 to 75 percent. The U.S. Coast Guard (USCG) land along the southeast shore occupies the flattest area of the island and has been enlarged through the placement of fill material.

The island is underlain by Franciscan Formation bedrock consisting of interbedded graywacke sandstone, mudstone, and claystone of varying proportions. On Yerba Buena Island (YBI), the majority of the Franciscan Formation is covered with unlithified sand and alluvial deposits, along with localized areas of artificial fill. There are several Franciscan Formation outcrops on YBI. The unconsolidated sedimentary deposits consist of silty sand with interbeds of clayey sand and clayey silt. Areas of artificial fill surrounding YBI, such as TI and part of the USCG station, were created by placing dredged Bay deposits and cut materials from YBI in relatively shallow water areas to create emergent usable pads.

Slope Stability. Existing landslides have been identified at various locations on YBI and appear to range from older, probably prehistoric, failures to recent failures. The modes of the slope failures include discontinuity-controlled rock failures (due to weakness in the rock), relatively deep-seated rotational landslides, and relatively surficial failures. Rock-wedge failures[20] have occurred in the Franciscan Formation slopes surrounding the northeast point and eastern YBI tunnel approach. The sizes of the rock-wedge failures are variable and range up to in excess of 30 meters (100 feet) in width and length. Of most concern is a larger rock-wedge failure in the vicinity of the proposed west column for the northern alignments. Relatively deep-seated rotational landslides are located on the west and northwest of the eastern YBI tunnel approach area but appear to have occurred outside of the project study area. The landslides appear to be older and probably failed prehistorically. A number of relatively shallow slope failures are located in unconsolidated sedimentary deposits on the southwest slope of the eastern YBI tunnel approach above the USCG station. These landslides

[19] Although the 1906 earthquake has been given an 8+ magnitude by some, the best estimate and also the current consensus among seismologists is 7.8.

[20] A rock-wedge failure is characterized as a movement or sliding of a rock mass, possibly including overlying soil, along existing discontinuities such as fractures or joints within the rock fabric. Movement or sliding typically occurs along layers or zones of low shear strength materials that have formed within the rock mass. Uplifting, folding, and faulting may cause the rock to develop low shear strength.

are up to 45 meters (150 feet) high, 61 meters (200 feet) wide, and 6 meters (20 feet) thick.[21] Some of the landslides have occurred recently. Additional debris-flow failures and zones of shallow creeping soils have been identified in the Franciscan Formation on the northwest and southeast slopes of the eastern YBI tunnel approach and on the east and north facing slopes of the northeast point.

Portion of the Project Area in the Bay

In general, the area has a westerly thinning sequence of Holocene- and Pleistocene-age marine and alluvial sediments overlaying Franciscan Formation bedrock, which ranges from near the surface at YBI to over 100 meters (328 feet) below the Bay bottom near the Oakland Touchdown. The marine sediments are primarily clays and silts, while the alluvial sediments are more commonly sands. The Holocene- and Pleistocene-age sequence in some areas of the study area has been eroded by various episodes of channeling. In general, marine clays are thicker and the alluvial sands are thinner (or absent) within buried paleochannels.

Oakland Touchdown

The eastern approach to the San Francisco-Oakland Bay Bridge (SFOBB) sits on a man-made spit that extends out into San Francisco Bay. The site is generally flat, rising approximately 1.5 to 3 meters (5 to 10 feet) above sea level. The area is a former tidal flat that was filled prior to the construction of the existing SFOBB in the 1930s. The source of the fill is not known, but was likely a combination of dredged soil and imported fill, including some rubble and other debris. Due to the fill, settlement of the underlying Young Bay Mud has likely occurred, creating mud that is stronger than its nearby marine counterpart.

The Franciscan Formation in this area is deep (an elevation of -135 to -150 meters [-440 to -500 feet]) and slopes gently to the east/southeast.[22] A sequence of Holocene- and Pleistocene-age marine and alluvial sediments overlie the bedrock. The subsurface soils vary and consist of generally less than 3 meters (10 feet) of loose, sandy fill that is underlain by a very soft, saturated layer of Bay mud that extends down to approximately 12 meters (40 feet).[23,24] In other areas, the soil is composed of coarser grain sediments that include various amounts of gravel. The primary material in the underlying Merritt-Posey-San Antonio Formation at the Oakland Touchdown is a layer of dense sand of approximately 4.5 to 6.1 meters (15 to 20 feet) thick. A north-south trending paleochannel exists under the Oakland Touchdown area. This paleochannel does not appear to contain alluvial sands.

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[21] Fugro and Earth Mechanics, *Preliminary Yerba Buena Island Geotechnical Site Characterization Report San Francisco-Oakland Bay Bridge East Span Seismic Safety Project*, prepared for Caltrans, June 1998.

[22] Fugro and Earth Mechanics, *Preliminary Oakland Shore Approach Geotechnical Site Characterization Report San Francisco-Oakland Bay Bridge East Span Seismic Safety Project*, prepared for Caltrans, June 1998.

[23] Apex, *Report Site Investigation San Francisco-Oakland Bay Bridge, East Bay Span, Oakland, California*, State of California, Department of Transportation, March 1994.

[24] Olivia Chen Consultants, *EBMUD Sodium Bisulfite Facilities for Main WWTP Geotechnical Findings and Foundation Recommendations*, CH2M Hill, September 1995.

3.7.4 Tsunamis

Tsunamis are seismically induced "sea waves" that are generated when large subsea earth or rock masses are displaced during earthquakes or very large landslides. The low-amplitude very-long-period waves travel very quickly and increase significantly in size and height upon entering shallow water. The waves can cause significant damage to coastal areas.

A map prepared in 1972 by the U.S. Geological Survey (USGS), entitled "Maps Showing Areas of Potential Inundation by Tsunamis in the San Francisco Bay Region, California," indicates that the Oakland Touchdown area would be inundated with about 3.1 to 3.7 meters (10 to 12 feet) of water if a 6.1-meter (20-foot) wave were to occur at the Golden Gate. (A 6.1-meter [20-foot] wave approximates the run-up that occurred at Crescent City, California, due to the 1964 Alaska earthquake.) Given the hypothetical nature of the information, it is likely the inundation level at the Oakland Touchdown area would be lower, at a level closer to 1 meter (3.3 feet).[25]

According to the USGS map, the portion of the bridge on YBI would not be inundated by a 6.1-meter (20-foot) tsunami, although lower-lying fill areas such as the USCG station could be subject to damage.

[25] Source: Gerry Houlihan, T. Y. Lin International, Inc.

3.8 WATER RESOURCES AND QUALITY

3.8.1 Regulatory Setting

Federal

The point source discharge of any pollutants to Waters of the U.S. is regulated under the Federal Water Pollution Control Act by the National Pollutant Discharge Elimination System (NPDES) Program. The Environmental Protection Agency (EPA) administers the NPDES program throughout the nation, and it has given regulatory authority to those states with a local regulatory body. (See State discussion below for further details.)

Section 401 of the Federal Clean Water Act (FCWA) applies to the SFOBB East Span Project. Under the Section 401 Water Quality Certification Program, every applicant for a federal permit or license for an activity which may result in a discharge into a water body must request state certification that the proposed activity will not violate state and federal water quality standards.

State

In the State of California, under the Porter-Cologne Water Quality Control Act, the State Water Resources Control Board has the ultimate authority over state water rights and water quality policy. The NPDES program in California is implemented by the State Water Resources Control Board through its nine Regional Water Quality Control Boards (RWQCBs) (also established under the Porter-Cologne Act).

A NPDES permit is required for any proposed point source waste or storm water discharges from municipal areas with populations of 100,000 or more to surface waters and from construction activities disturbing 2 hectares (5 acres) or more of land. Caltrans District 4 currently operates under statewide NPDES Permit No. CAS000003, which covers all Caltrans activities, including those within the boundaries of RWQCB's jurisdiction. As a result, the East Span Project is covered under this NPDES permit.

The RWQCB has adopted a Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan), which sets forth water quality objectives to protect and enhance the beneficial uses of the Bay and its tributaries. Beneficial uses of the waters in San Francisco Bay include commercial and sport fishing, estuarine habitat, industrial service and process supply, fish migration, navigation, preservation of rare and endangered species, recreation, shellfish harvesting, fish spawning, and wildlife habitat. Water quality objectives, which can be narrative or measurable, include parameters such as bacteria, bioaccumulation, biostimulatory substances, color, dissolved oxygen, floating material, oil and grease, population and community ecology, pH, salinity, sediment, suspended material, settleable material, sulfide, temperature, toxicity, turbidity, and un-ionized ammonia. Some of the objectives are listed in Table 3.8-3 along with the Central Bay's status in regard to the objectives.

The RWQCB administers Section 401 of the Federal Clean Water Act, as described above. The RWQCB issues certifications that proposed projects will not violate state

and federal water quality standards. Caltrans will obtain a Water Quality Certification for this project from the RWQCB prior to project construction.

3.8.2 Existing Drainage Patterns and Water Quality

The San Francisco Bay has a drainage area of many thousand square kilometers. It is the primary point of outfall to the Pacific Ocean for a large portion of California.

Flood Flows

Flood flows are not defined beneath the SFOBB. The influence of flood flows on the project area is minimal because of its location in relation to the tributary streams to San Francisco Bay.

Tidal Influences

Central San Francisco Bay, in the vicinity of the East Span Project, is influenced by the tides of the Bay. The frequency and height of tides throughout the Bay have been estimated by the ACOE.[26] Table 3.8-1 summarizes the tidal elevations for the Bay, as measured at two tide measuring stations in the project area.

Table 3.8-1 High Tide Elevation

	Station			
	Matson Wharf[a]		Yerba Buena Island[a]	
Frequency	**meters[b,c]**	**feet[b,c]**	**meters[b,c]**	**feet[b,c]**
10-year	1.80	5.9	1.80	5.9
50-year (interpolated)	1.89	6.2	1.89	6.2
100-year	1.92	6.3	1.92	6.3
100-year (adopted)	**1.98**	**6.5**	**1.98**	**6.5**
500-year	2.01	6.6	2.01	6.6

Source: U.S. Army Corps of Engineers, 1984.

[a] Matson Wharf (Station 4779) is located in the Oakland Touchdown area. The YBI station is Station 4782.
[b] Elevations per NGVD (National Geodetic Vertical Datum).
[c] To estimate elevations above mean lower low water, add an additional 0.896 meter (2.94 feet) to the values in the table.

The high tide elevations presented in Table 3.8-1 are based on historical tidal data. The EPA and other agencies believe that concentrations of atmospheric gases will continue to increase in the coming decades, resulting in global warming and subsequent thermal expansion, which will cause the sea level to rise. The ACOE has made an attempt to adjust the predicted tidal elevations based on historical data to include this expected increase in sea level. Table 3.8-2 shows high tide elevations that have been adjusted for expected increases in sea level.

[26] U.S. Army Corps of Engineers, *San Francisco Bay, Tidal Stage vs. Frequency Study,* October 1984.

Table 3.8-2 Tidal Elevations Including Estimated Sea Level Rise

	Planning Year			
	Year 2000		Year 2050	
Frequency	**meters**	**feet**	**meters**	**feet**
10-year	1.89-1.92	6.2-6.3	2.32-2.60	7.6-8.53
50-year (interpolated)	1.98-2.01	6.5-6.6	2.41-2.69	7.90-8.83
100-year	2.01-2.04	6.6-6.7	2.44-2.72	8.00-8.92
100-year (adopted)[a]	**2.07-2.10**	**6.8-6.9**	**2.50-2.78**	**8.20-9.12**
500-year	2.10-2.13	6.9-7.0	2.53-2.84	8.30-9.33

Source: U.S. Army Corps of Engineers, 1984.
Notes: Year 2000 estimated rise 0.09-0.12 meter (0.3-0.4 foot); Year 2050 estimated rise 0.52-0.80 meter (1.7-2.6 feet).
Elevations per NGVD (National Geodetic Vertical Datum).

[a] The values presented in the table are from the U.S. Army Corps of Engineers. Data from the San Francisco Bay Conservation and Development Commission[27] can also be extrapolated to obtain tidal elevation values for the planning years 2000 and 2050. These values would be 2.04 meters (6.7 feet) for the year 2000 and 2.19 meters (7.2 feet) for the year 2050. These lower values were used in the design planning process for the East Span Project.

Surface Water Quality

The surface water body in the project area is the Central San Francisco Bay, which connects to the Pacific Ocean through the Golden Gate Channel. Surface runoff from the project area flows directly or indirectly into the Central San Francisco Bay. The surface runoff is composed of freeway runoff from the SFOBB and I-80 and the SFOBB Toll Plaza, urban runoff from adjacent streets, and the land runoff from adjacent industrial sites and open areas. Other discharges to the Central San Francisco Bay include discharges from municipal wastewater treatment plants, discharges from dredging operations, and discharges from other industrial processes.

Since 1993, surface water quality throughout the estuary (San Francisco Bay) has been evaluated by the Regional Monitoring Program (RMP). The San Francisco Estuary Institute (SFEI), a non-profit scientific organization established in 1983, was chosen by the RWQCB and Bay Area dischargers to administer the program. The RMP is funded by Bay Area dischargers as well as federal and state agencies. The YBI station is located in the project area. In addition, three other stations are located in the vicinity of the project study area. These stations are: Alameda Station, located upstream of the project area; Point Isabel Station, located downstream of the project area toward the Central Bay; and Horseshoe Bay Station, located downstream of the project area toward the Golden Gate Channel.

The SFEI 1996 Annual Report[28] covers the fourth year of the RMP. The results for the 1996 study period indicate that, in general, there are water quality variations from

[27] San Francisco Bay Conservation and Development Commission, *Sea Level Rise: Predictions and Implications for San Francisco Bay*, October 1988, revised.

[28] San Francisco Estuary Institute, 1996 Annual Report, Regional Monitoring Program, 1997.

season to season. Table 3.8-3 presents a summary of the concentrations of various pollutants in the Central Bay monitored in 1996.

Table 3.8-3 Central San Francisco Bay Surface Water Concentrations

Pollutant	Range of Concentrations	RWQCB Water Quality Objective
Salinity	5-32 parts per thousand	Controllable water quality factors shall not increase salinity of waters so as to adversely affect beneficial uses.
Total Suspended Solids	2-25 µg/L	Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.
Dissolved Organic Carbon	960-3,840 µg/L	No objective
Nutrients:		
ammonia	10.92-159.46 µg/L	Annual mean 0.025 mg/L, maximum 0.16 mg/L
nitrite	185.64-487.34 µg/L	No objective
nitrate	9.24-58.8 µg/L	No objective
phosphate	59.83-207.7 µg/L	No objective
Trace Elements:		
arsenic	1.5-2.1 µg/L	4-day average 36.0 µg/L, 1-hour average 69.0 µg/L
cadmium	0.03-0.10 µg/L	4-day average 9.3 µg/L, 1-hour average 43.0 µg/L
chromium	0.1-3 µg/L	4-day average 50.0 µg/L, 1-hour average 1100.0 µg/L
copper	0.4-3.3 µg/L	1-hour average 4.9 µg/L
lead	0.05-0.9 µg/L	4-day average 5.6 µg/L, 1-hour average 140.0 µg/L
nickel	0.5-7 µg/L	24-hour average 7.1 µg/L, instantaneous 140.0 µg/L
zinc	0.3-8 µg/L	24-hour average 58.0 µg/L, instantaneous 170.0 µg/L

Note: µg/L = microgram per liter
Source: Caltrans District 4, April 1998.

3.8.3 Groundwater

The east end of the project, at the Oakland Touchdown, lies over the East Bay Plain groundwater basin in Alameda County. Existing and potential beneficial uses as designated in the San Francisco Bay Basin Water Quality Control Plan for this regional basin include municipal and domestic water supply, industrial service water supply, industrial process water supply, and agricultural water supply. The East Bay Plain extends over an area of 295 square kilometers (114 square miles), with an average depth to aquifer below land surface ranging between 8 meters (25 feet) and 183 meters (596 feet), and a storage capacity of 3.4 billion cubic meters (2,770,000 acre-feet).

3.9 NATURAL RESOURCES

This section addresses existing vegetative communities and associated wildlife, special status plant and wildlife species, special aquatic sites, wetlands, and non-wetland waters of the United States that occur in the project area. Detailed survey information is provided in the Natural Environment Study and Biological Assessment.

3.9.1 Regulatory Setting

Natural resources in the project area were evaluated in accordance with the provisions of state and federal environmental statutes and regulations, including the following:

- Federal Endangered Species Act of 1973 (as amended). This law protects plant and animal species (and their habitats) listed under the Act as either Threatened, Endangered, or proposed for listing as Threatened or Endangered. Species are listed as endangered if found to be in danger of extinction throughout all or a significant portion of their range. Threatened species are identified under the federal act as those likely to become endangered within the foreseeable future. Species are listed after being presented in a formal petition and public review process that is documented in the Federal Register;

- California Endangered Species Act of 1985. This is similar to the federal act, but it applies only to plant and animal species that occur in the state of California. Individual species declared to be either threatened or endangered by the California Fish and Game Commission are included in Title 14 of the California Code of Regulations;

- Federal Clean Water Act (Section 404). The Clean Water Act applies to the disposal of dredged or fill materials into the "Waters of the United States." Waters of the U.S. include those used for navigation or leading to navigable rivers, waters used for interstate commerce including isolated wetlands, lakes, and wetlands bordering streams or other water bodies;

- Federal Rivers and Harbors Act of 1899. Section 10 of the Rivers and Harbors Act prohibits the unauthorized obstruction or alteration of any navigable water. Navigable waters are those "subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce" (40 CFR 1989);

- Marine Mammal Protection Act. This federal legislation provides for the protection and conservation of marine mammal species by prohibiting the harassment, hunting, capture, or killing of any marine mammal;

- Migratory Bird Treaty Act. Originally enacted in 1918, this federal legislation reflects agreements made between the U.S. and England, Mexico, the former Soviet Union, and Japan to protect all of North America's migratory bird populations;

- McAteer-Petris Act. This state legislation was passed in 1965 and created the San Francisco Bay Conservation and Development Commission (BCDC). BCDC regulates dredging and filling within the San Francisco Bay and public access within 30 meters (100 feet) of the mean high tide line;

- Magnuson-Stevens Act of 1976 (as amended 1996). This act applies to fisheries resources and fishing activities in Federal waters that extend to 322 kilometers (200 miles) off-shore. Conservation and management of U.S. fisheries, development of domestic fisheries, and phasing out foreign fishing activities are the main objectives of the legislation; and

- Executive Order 11990 (Protection of Wetlands). An order given by President Carter in 1977 to avoid the adverse impacts associated with the destruction or modification of wetlands.

3.9.2 Vegetative Communities and Wildlife

Most of the terrestrial vegetation within the project area consists of non-native plant species. Patches of native vegetation occur on Yerba Buena Island (YBI) and include coast live oak woodland, and northern coastal scrub. The Oakland Touchdown area consists primarily of ruderal vegetation, occurring at the former Oakland Army Base property. Small patches of northern foredune and landscaped vegetation occur along the north side of the Oakland Touchdown area. Figures 3-17 and 3-18 in Appendix A show the habitat types found on YBI and in the Oakland Touchdown area, respectively. Terrestrial vegetative communities and associated wildlife species are summarized below.

Landscaped Non-Native Plant Communities

Typical landscaped species found on YBI include Tasmanian blue gum (*Eucalyptus globulus*), German ivy (*Senecio mikanioides*), and Monterey cypress (*Cupressus macrocarpa*). Native plant species are largely excluded from these areas because of a lack of light due to the density of the overstory canopy, accumulation of debris from overstory trees, human disturbance, and poor soil conditions. Ornamental landscape species at the Oakland Touchdown include iceplant (*Carpobrotus edulis*), Monterey pine (*Pinus radiata*), and acacia (*Acacia spp.*). Landscaped areas are not considered to be sensitive habitat for plant or wildlife species. Common wildlife species that occur in landscaped areas include the European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), Anna's hummingbird (*Calpte anna*), Virginia opossum (*Didelphis virginiana*), Norway rat (*Rattus norvegicus*), striped skunk (*Mephitis mephitis*), and raccoon (*Procyon lotor*).

Ruderal Vegetation

Areas that have been heavily disturbed contain ruderal vegetation generally characterized by herbaceous, non-woody species. Ruderal vegetation occurs at the Oakland Touchdown area on the former Oakland Army Base property and at scattered sites along the north side of the existing roadway. These areas provide winter roosting areas for shorebird species during high tides. Some of the shorebird species known to

use these areas include western sandpiper (*Calidris mauri*), semipalmated plover (*Charadrius semipalmatus*), and dunlin (*Calidris alpina*).[29]

Coast Live Oak Woodland

Only a few tree and shrub species associated with coast live oak woodland occur in small patches on YBI, near Macalla Road. Species present include toyon (*Heteromeles arbutifolia*), blue elderberry (*Sambucus mexicanus*), California hazelnut (*Corylus cornuta*), and a few California buckeye (*Aesculus californica*). Understory plant species observed include native species such as poison oak (*Toxicodendron diversilobum*) and California blackberry (*Rubus ursinus*). Non-native plant species observed within the coast live oak woodland include German ivy, Himalayan blackberry (*Rubus discolor*), and Tasmanian blue gum.

Typical wildlife species associated with coast live oak woodland include northern flicker (*Colaptes auratus*), mourning dove (*Zenaida macroura*), western gray squirrel (*Sciurus griseus*), western fence lizard (*Sceloporus occidentalis*), and gopher snake (*Pitouphis melanoleucus*). The black-crowned night heron (*Nycticorax nycticorax*), a species protected under the Migratory Bird Treaty Act, nests and roosts on YBI woodland.

Northern Coastal Scrub

A few patches of northern coastal scrub occur on steep bluffs along the east end of YBI. The dominant plant species in this area is California sagebrush (*Artemisia californica*). Common plant species include farinosa dudleya (*Dudleya farinosa*), yarrow (*Achillea millefolium*), and seaside woolly sunflower (*Eriophyllum staechadifolium*). Wildlife species that could be expected to occur in coastal scrub habitat include white-crowned sparrow (*Zonotrichia leucophrys*), bewick's wren (*Thryomanes bewickii*), and vagrant shrew (*Sorex vagrans*).

Northern Foredunes

A patch of northern foredunes is located on the northern shoreline of the Oakland Touchdown area at Radio Point Beach. The dominant plant species include beach bur (*Ambrosia chamissonis*), fig-marigold (*Carpobrotius edulis*), commonly known as iceplant, and saltgrass. A band of marsh gumplant (*Grindelia stricta* var. *angustifolia*), a California Native Plant Society (CNPS) List 4 species, occurs in a depression behind the foredune area. This area is bound by potential jurisdictional wetlands and large patches of fig-marigold.

3.9.3 Estuarine Environment and Associated Species

The San Francisco-Oakland Bay Bridge (SFOBB) is located in the Central Bay Segment of the San Francisco Bay Estuary. The estuary is commonly divided into several segments (listed from north to south): Suisun Bay, Carquinez Strait, San Pablo Bay, Central Bay, and South Bay. The San Francisco Bay Estuary sits at the terminus of the Sacramento-San Joaquin Delta, a system that drains 40 percent of the land area of California. The San Francisco Bay Estuary and the Sacramento-San Joaquin Delta

[29] Caltrans, Memorandum regarding Wintering Bird Surveys Along the Cypress Reconstruction Mitigation Bike Path, August 1995.

together form one of the largest estuarine systems in North America. Aquatic habitats in the estuary range from deep channel bottoms to shallow marsh pools.

Several species of waterfowl use this habitat in the winter months, including lesser scaup (*Aythya affinis*), surf scoter (*Melanitta perspicillata*), and canvasback (*Aythya valisineria*). Other avian species that are often observed in the project area include brown pelican (*Pelecanus occidentalis*) and western gull (*Larus occidentalis*). A common marine mammal found foraging in the project area is the harbor seal (*Phoca vitulina*).

Northern Coastal Salt Marsh

A small narrow band of northern coastal salt marsh occurs on the north side of YBI adjacent to Clipper Cove. A narrow strip of this habitat also occurs along the north side of Radio Point Beach, adjacent to the Oakland Touchdown. Dominant plant species found in northern coastal salt marshes include pickleweed (*Salicornia virginica*) and saltgrass (*Distichilis spicata*). Animals that have the potential to occur within coastal salt marsh vegetation include the northern salt marsh harvest mouse (*Reithrodontomys raviventris*), a federally endangered species. However, the northern salt marsh harvest mouse does not occur at Clipper Cove or Radio Point Beach because the isolated, narrow band of habitat is not sufficient to support even a small population.

This vegetative community also occurs within the Emeryville Crescent outside the project area. Salt marsh habitat along the Emeryville Crescent provides important breeding and foraging habitat for a variety of migratory and resident wildlife species, including the saltmarsh harvest mouse (*Reithrodontomys raviventris*). Migratory bird species common to salt marsh habitat include northern pintail (*Anas acuta*), mallard (*Anas platyrhynchos*), least sandpiper (*Calidris minutilla*), and willet (*Catoptrophorus semipalmatus*). Resident species that commonly use this habitat include great blue heron (*Ardea herodias*), marsh wren (*Cistothorus palustris*), red-winged blackbird (*Agelaius phoeniceus*), California clapper rail (*Rallus longirostris obsoletus*), and California red-backed vole (*Clethrionomys californicus*).

Intertidal Sand Flats

Intertidal flats occur on the north shore of the Oakland Touchdown and adjacent to the USCG facility at YBI. These areas have a larger grain size (>0.6 millimeter [0.02 inch]) than is typical of mudflats (<0.1 millimeter [0.004 inch]), and are more accurately described as sand flats. These intertidal flats have rivulets and channeling which are attributes of sand flats and not mudflats. The larger grain size of sand flats is due to higher wave energy. Both sand flats and mudflats are special aquatic sites protected under Section 404 of the Clean Water Act.

Sand flats are sparsely vegetated intertidal areas that occur from approximately mean lower low water (MLLW) to mean tide level (MTL) and are exposed at low tides and inundated at high tides. They provide protection to banks and upland shoreline from wave energy and sediment. Sand flats around San Francisco Bay provide habitat for many species of invertebrates, including diatoms, polychaetes, oligochaetes, amphipods, isopods and crustaceans. During low tide, sand flats provide foraging and

roosting areas for nearly one million shorebirds that utilize the Bay during spring and fall migration. Shorebirds present in the project area include western sandpiper (*Calidris mauri*), least sandpiper (*Calidris minutilla*), dunlin (*Calidris alpina*), long- and short-billed dowitcher (*Limnodromus griseus,* and *L. scolopaceus,* respectively), and American avocet (*Recurvirostra americana*). The habitat value of the sand flats in the project area is diminished by the abrupt transition with adjacent uplands and the lack of adjacent wetland habitats. The existing shoreline adjacent to the sand flats at the Oakland Touchdown is protected with rock riprap and the uplands are landscaped with non-native vegetation.

During high tide, sand flats provide foraging habitat for fish, including longfin smelt (*Spirinchus thaleichthys)*, staghorn sculpin (*Leptocottus armatus*), starry flounder (*Platichthys stellatus),* and leopard shark *(Triakis semifasciata).* One of the few mammals that are occasionally present on sand flats is the Pacific harbor seal (*Phoca vitulina*).

Eelgrass (*Zostera marina L.*)

Eelgrass beds occur in some of the shallow waters within the project area at the Oakland Touchdown and at Clipper Cove and the Coast Guard facility at YBI. Eelgrass provides important nursery habitat and protection for many fish and invertebrate species, including herring. In addition, avian species are often observed foraging among vegetated shallows.

Eelgrass is typically present on shallow, gradually sloping sand, sand/mud, and sand/shell debris habitats. Eelgrass beds stabilize shorelines by dampening the wave energy that transports sediment to and from the shore, preventing erosion. They also improve water quality by collecting and filtering organic matter and sediments. This filtering acts as a nutrient pump, transferring waterborne nutrients to the sediments and invertebrates. Eelgrass is easily affected by changes in water quality and turbidity. It is extremely dynamic, expanding and contracting by as much as several hectares per season, depending on the quality of the site. Consequently, eelgrass beds can serve as an indicator community for the overall health of an estuary.

Open Water

The SFOBB is located in the Central Bay segment of the San Francisco Bay Estuary. The Central Bay is generally marine in character with waters that are cold, saline, and low in total suspended sediment. This section of the estuary is strongly influenced by tidal currents, due to its proximity to the Pacific Ocean. Fish swim through the Central Bay on their way to and from the entrapment zone, an area in the northern part of the Bay where fresh water flows from the Delta mix with brackish water flows from the estuary, trapping sediment and phytoplankton in the water column.

Fisheries. Several species of anadromous, marine, and estuarine species use the Bay/Delta for part of their life cycle. Anadromous species in the Central Bay, such as the native chinook salmon (*Oncorhynchus tshawytscha*), migrate through the open water areas of the Bay on their way to and from the tributaries of the Delta. Many marine species commonly found along the Pacific coast are found in the San Francisco Bay, including commercially and recreationally important Pacific herring (*Clupea*

harengeus), and 15 species managed by federal fisheries management plans and provided protection under the Essential Fish Habitat regulations promulgated by the Magnuson-Stevens Act. (See Table 3.9-1 for a list of the managed species.)

Table 3.9-1 Managed Fish Species Found in Central San Francisco Bay

Common Name	Scientific Name	Abundance
Northern anchovy	*Engraulis mordax*	Primary
Pacific sardine	*Sardinops asgax caerulrus*	Tertiary
Chinook salmon	*Oncorhynchus tshawytscha*	Secondary
English sole	*Parophrys vetulus*	Primary
Pacific sanddab	*Citharichtys sordidus*	Primary
Rex sole	*Glyptocephalus zachirus*	Tertiary
Sand sole	*Psettichthys melanostictus*	Tertiary
Starry flounder	*Platichthys stallatus*	Secondary
Leopard shark	*Triakis semifasciata*	Secondary
Big skate	*Raja binoculata*	Tertiary
Spiny dogfish	*Squalis acanthias*	Tertiary
Brown rockfish	*Sebastes auriculatus*	Secondary
Calico rockfish	*Sebastes dallii*	Tertiary
Cabezon	*Scorpaenichttys marmoratus*	Tertiary
Lingcod	*Ophidodon elongatus*	Tertiary

Notes: Primary = Species readily identifiable and common (in at least 1 percent of catch).
Secondary = Readily identifiable to species and uncommon (in less than 1 percent of catch).
Tertiary = Identification questionable or uncommon or rare in catch.
Source: Biological Assessment, June 1999.

Plankton. Phytoplankton in the San Francisco Bay Estuary are consumed by organisms, including clams, worms, mussels, and shrimp-like zooplankton called copepods. Zooplankton, in turn, are consumed by a variety of fish species and are especially important to the survival of juvenile fish. Important species of zooplankton in the Central Bay include the ghost shrimp and the shrimp-like euphausiids, commonly known as krill. A combination of factors, including water depth and transparency, river inflow, and freshwater export from the Delta, influence the ability of phytoplankton to receive adequate light for photosynthesis. These factors influence the productivity and concentrations of phytoplankton throughout the various regions of the Bay. Phytoplankton levels in the Central Bay generally remain low due to the high degree of tidal water exchange and mixing. However, diatoms may become abundant in the Central and South Bays because of changes in micro and macro nutrients, turbidity, light penetration, water temperature, wave-action, cloudiness, tidal mixing, and filtering organisms.

Benthos. Benthic organisms are filter feeders that strain phytoplankton and detritus from the water column and graze on nutrients that fall to the bottom sediment. A broad range of species is commonly found in the Bay along intertidal flats, the bottom of open water areas, and on hard surfaces below the intertidal zone. Some benthic organisms,

such as worms, burrow into the bottom sediment and others, such as oysters, crabs, flat worms, and copepods, live on the sediment surface. Others, including mussels, live on hard surfaces such as rocks and pilings. Existing submerged bridge structures and rocky outcrops may provide substrate for benthic invertebrates, including the bay mussel.

3.9.4 Wetlands and Waters of the United States

Wetland resources in the project study area include "special aquatic sites" regulated by the Army Corps of Engineers (ACOE) under Section 404 of the federal Clean Water Act and Waters of the U.S. regulated under Section 10 of the Rivers and Harbors Act. Special aquatic sites found in the project area include non-tidal wetlands, tidal wetlands, sand flats, and eelgrass beds. A delineation of jurisdictional wetlands, as defined by the ACOE, was conducted in the project area. Potential jurisdictional wetlands were delineated in the field using methods outlined in the 1987 ACOE Wetland Delineation Manual.[30] Jurisdictional wetlands are defined when three conditions exist: 1) presence of hydric soils, 2) presence of saturated, inundated or ponded/flooded hydrologic conditions during the growing season, and 3) presence of hydrophytic vegetation. Special aquatic sites and waters of the U.S. in the project area are shown on Figures 3-19 and 3-20 in Appendix A. The following is a description of the wetlands, mudflats, eelgrass beds, and waters of the U.S. in the project area.

Wetlands

Wetlands possess unique functions and values that vary depending on the type of wetland, its size, surrounding land uses, and the degree to which it has been previously disturbed. Wetland functions are defined as the physical, chemical, and biological attributes of a wetland, such as flood storage, species habitat, or groundwater discharge. Other functions of wetlands may have specific "values" that are considered beneficial to society, such as groundwater recharge, recreation, or aesthetics. Each wetland type was evaluated separately to determine general wetland functions and values. The following are standard functions used to assess each wetland type:

- Wildlife diversity/abundance;
- Aquatic diversity/abundance; and
- Uniqueness/heritage.

The total area of jurisdictional wetlands in the project area is 0.07 hectare (0.18 acre).

There are five wetland sites in the project area. One tidal wetland site is a narrow strip located along the high tide line of Radio Point Beach. Approximately 0.01 hectare (0.03 acre) of this wetland is within the project area and another 0.01 hectare (0.03 acre) extends outside of the project area to the northeast. Vegetation in this area consists of saltgrass (*Distichlis spicata*) and searocket (*Cakile maritima)*, both hydrophytic plants that are considered wetland indicator species. This vegetation is

[30] Environmental Laboratory, *Corps of Engineers Wetlands Delineation Manual,* Technical Report Y-87-1, U.S. Army Engineer Waterways Experiments Station, 1987.

growing at or slightly above the high tide line. A muted tidal wetland occurs behind the foredune area outside of the project area (wetland sample point B-1 shown on Figure 3-20 in Appendix A). Two small non-tidal wetland areas occur within the project area on Port of Oakland property, located just south of the existing highway. One wetland area at this site is 0.03 hectare (0.07 acre) and includes rabbit foot grass (*Polypogon monspeliensis)*, a wetland indicator species. This site appears to have been recently used for construction staging and storage, and it is likely that the topographic depression was created by these activities. West of this site there is another non-tidal wetland area also located on Port of Oakland property. This wetland is 0.02 hectare (0.05 acre) and consists of wetland indicator species, including brass buttons (*Cotula coronopifolia*), sourclover (*Melitotus indica*), and rabbit foot grass.

Another small band of tidal wetlands occurs on the north side of YBI (see Figure 3-19 in Appendix A). This wetland band extends for approximately 90 meters (295 feet) along the high-tide line and is approximately 1 meter (3.28 feet) wide. The total wetland area is approximately 0.01 hectare (0.03 acre). Wetland vegetation in this area is comprised of pickleweed, fat hen (*Atriplex triangulars)*, and saltgrass. This wetland area is described as northern coastal salt marsh in Section 3.9.3 — Estuarine Environment and Associated Species.

""The tidal wetlands present in the project study area are predominantly remnant wetlands surrounded by non-native species. Compared to the tidal wetlands located in the Emeryville Crescent, tidal wetlands in the project area do not provide extensive habitat for wildlife and, therefore, their functions and values are limited. The non-tidal wetland areas are also characterized by limited functions and values due to human disturbance and lack of wetland species diversity. The non-tidal wetlands are unlikely to provide habitat for wildlife species.

Sand Flats

Sand flats were delineated and are present in the project area between the Mean High Water (MHW) line, elevation 0.8 meter (2.7 feet) NGVD, and the MLLW. The lower limits of the sand flats were determined from aerial photographs taken during approximately a –0.85 tide. The upper limits of the sand flats were determined in the field using GPS equipment.

Within the project area, sand flats occur along the north side of the Oakland Touchdown area at the eastern bridge abutment and east of the USCG station on YBI. Approximately 2.1 hectares (5.1 acres) of sand flats are located between Radio Point Beach and the eastern bridge abutment. These sand flat areas provide a moderate level of functions and values as foraging habitat for a variety of bird species. The functions and values of sand flats are discussed in more detail in Section 3.9.3 — Estuarine Environment and Associated Species.

Eelgrass (*Zostera marina L.*)

Preliminary surveys of eelgrass habitat in the project area were conducted in 1997 and 1998. More detailed surveys were conducted in 1999 and 2000 (a pre-construction

survey only for Replacement Alternative N-6).[31] Eelgrass beds were surveyed in the field during Mean Low Water (MLW) when the potential for observing the edge of eelgrass beds or individual stands is easiest. Fathometer surveys and bottom grab samples were taken when eelgrass was not visible from the water surface or when visibility was otherwise not suitable to determine eelgrass distribution. Eelgrass beds are present in the San Francisco Bay Estuary from Mean Lower Low Water (MLLW), elevation -0.9 meter (2.9 feet) National Geodetic Vertical Datum (NGVD), to 1.5 meters (5 feet) below MLW. Eelgrass survey methods included use of specialized acoustic (sonar) equipment to locate and map the occurrence of the eelgrass beds. Divers were used to verify the sonar readings, determine eelgrass bed density, and the density of the existing grass shoots.

Locations of eelgrass beds are shown on Figures 3-17 and 3-18 in Appendix A. The eelgrass beds in the project vicinity totaled approximately 16.4 hectares (40.6 acres) at the time of the October 1999 surveys. Approximately 0.7 hectares (1.8 acres) occur adjacent to YBI and approximately 15.7 hectares (38.8 acres) occur north of the Oakland Touchdown area.

The most extensive eelgrass beds were identified north of the Oakland Touchdown. The distribution of these eelgrass beds extends in depths ranging from about 1.1 to 1.5 meters (3.5 to 5.0 feet) and has exhibited dramatic fluctuations in size and density from year to year. Eelgrass beds in this area are patchy, occurring within 3.0 to 4.6 meters (10 to 15 feet) of each other. Approximately 2,493 individual eelgrass patches were recorded in this area during the 1999 surveys with patches varying from 1.5 to 3.6 meters (5 to 12 feet) in diameter.

Four eelgrass bed areas were identified near YBI, two within Clipper Cove on the north side of YBI, and two within Coast Guard Cove on the south side of YBI. Eelgrass beds in these areas occur along the edges of the shoreline and extend to areas no greater in depth than 1.1 to 1.5 meters (3.5 to 5.0 feet).

Eelgrass is easily affected by environmental factors such as changes in water quality and turbidity. This habitat type is extremely dynamic, expanding and contracting by as much as several hectares per season, depending on the quality of the site and environmental factors.

Waters of the U.S

Waters of the U.S. within the study area include "waters...that are subject to the ebb and flow of the tide shoreward to the Mean High Water mark" that are used to transport

[31] Caltrans completed a pre-construction survey for Replacement Alternative N-6. The physical survey was conducted in October 2000, with data generation and review being completed in January 2001. This survey has a limited purpose as opposed to prior surveys: it is a pre-construction survey intended to provide current data immediately prior to construction of a particular alternative to measure actual impacts to the greatest extent possible. Accordingly, this survey only covers the area impacted by Replacement Alternative N-6. Since the survey was not intended for the purposes of an alternatives analysis, it did not include areas impacted by other alternatives. As anticipated, the area occupied by the eelgrass beds at YBI and the Oakland Touchdown area has changed due to the natural annual variability in such beds. As the eelgrass beds have grown between 1999 and 2000, the overall percentage of area impacted has not changed to any appreciable degree.

interstate or foreign commerce, as described under Section 10 of the Rivers and Harbors Act (33 Code of Federal Regulation Part 322.2). The project area is bisected by a navigation opening that is under the jurisdiction of the USCG. Section 10 jurisdiction extends to the MHW mark on the north and south sides of the SFOBB. Section 404 jurisdiction extends to the High-tide Line (HTL) on the north and south sides of the bridge. Impacts to special aquatic sites, including sand flats and eelgrass beds, are regulated under Section 404 of the Federal Clean Water Act.

3.9.5 Jurisdiction of the Bay Conservation and Development Commission

Under the McAteer-Petris Act, the San Francisco Bay Conservation and Development Commission (BCDC) has jurisdiction over all areas of the Bay that are subject to tidal action. BCDC's San Francisco Bay jurisdiction includes subtidal areas, intertidal areas, and tidal marsh areas that are between mean high tide and 1.5 meters (5 feet) above mean sea level. In addition, BCDC has jurisdiction over a 30.5-meter (100-foot) shoreline band surrounding the Bay from the mean high tide line. For the SFOBB project, the area subject to BCDC jurisdiction includes the shoreline on YBI and on the Oakland Touchdown. BCDC's jurisdiction does not extend to federally owned areas such as the Navy or USCG property on YBI, because they are excluded from state coastal zones pursuant to the Coastal Zone Management Act.

3.9.6 Plants and Wildlife

This section identifies special status plant and wildlife species protected under the federal and state Endangered Species Acts with potential to occur in the vicinity of the project area, as documented by lists compiled from various sources. Based on those lists, surveys of the habitat in the project area were conducted, and consultations with biologists were completed to identify specific species and habitats potentially impacted by the project alternatives. Many of the species identified through these sources have the potential to occur within the greater regional area but are not present within the project area due to the lack of suitable habitat. This section also identifies certain wildlife species that are known to occur within the project area and are protected by the Migratory Bird Treaty Act, the Magnuson-Stevens Act, or the Marine Mammal Protection Act. Tables 3.9-2 and 3.9-3, at the end of this section, provide a comprehensive list of the species discussed below.

Plants

A list of special status plant species, shown in Table 3.9-2, contains 42 species that have the potential to occur in the East Span Project area. This list was compiled based on the list of species provided by U.S. Fish and Wildlife Service (USFWS) in its letter of August 29, 1997 (see Appendix G for a copy of the letter), a literature review, a review of the California Natural Diversity Database (CNDDB), and California Native Plant Society's (CNPS's) Inventory Database. The CNPS is an independent organization that reviews and maintains information on rare native plants in California. In an effort to categorize degrees of concern for rare plants, the CNPS developed four lists which indicate rarity and status descriptions of endangered plants. The first two categories, List 1B and List 2, indicate plants that could qualify for listing as rare, threatened, or

endangered. List 3 includes plants for which more information is needed to classify them. The List 4 category includes plants of limited distribution that are considered important species locally.

Surveys for plants were conducted in Fall 1997 and Spring 1998 to assess the known and potential occurrence of threatened and endangered species. Survey dates were selected to optimize the likelihood of observing target species during their blooming period. While plant species have the potential to occur in the project area, results of the surveys indicate that only the marsh gumplant occurs in the project area. A brief description of the marsh gumplant is provided below.

Marsh Gumplant (*Grindelia stricta*). Marsh gumplant is included on List 4 of the CNPS Inventory. It has no federal or state status; however, it is considered to be locally significant and has been included in the CNPS list of species which have limited distribution (List 4). This species was observed during botanical surveys on the northern portion of the YBI and the Oakland Touchdown.

Wildlife

A list of special status species and their legal status are provided in Table 3.9-3. This table contains species that could possibly be found in the vicinity of the East Span Project area. These species were compiled based on the list of species provided by the USFWS and NMFS, a literature review, and a review of the CNDDB. Only the wildlife species described below have the potential to occur in the project area because suitable or marginally suitable supporting habitat is present. All migratory bird species such as western gulls, peregrine falcons, and double-crested cormorants are protected by the Migratory Bird Treaty Act.

Surveys for wildlife and aquatic species were not conducted for this project, given the availability of information from previous studies, including avian surveys, entomology field surveys, reptile and amphibian surveys, and marine mammal studies. A brief description of wildlife species known to occur in the project area is provided below.

Harbor Seal (*Phoca vitulina*). Harbor seals are protected from harassment under the Federal Marine Mammal Protection Act of 1972, as amended. Foraging sites are generally close to shore where medium-sized fish in addition to bivalves, crab, octopus, herring, and squid are taken as prey. Harbor seals use the south side of YBI as a haul-out site year-round. This site is located approximately 305 meters (1,000 feet) from the nearest construction limit boundary.

California Sea Lion (*Zalophus californianus*). Like the harbor seal, the California sea lion is protected by the Federal Marine Mammal Protection Act. While little information is available on the foraging patterns of California sea lions in the Bay, individual sea lions have been observed on a fairly regular basis in the shipping channel to the south of YBI. Individuals have also been sighted in the waters east of YBI. Pier 39 in San Francisco, about 6 kilometers (4 miles) from the project site, has become a haul-out site for sea lions. Most of the sea lions hauled out at this site are males and no pupping has been observed.

Gray Whale (*Eschrichtius robustus*). Protected under the Marine Mammal Protection Act, the gray whale has been sighted more frequently in recent years in San Francisco Bay. Reduced food supply in the Bering Sea has been suspected as the most probable cause. Sightings have included areas off Sausalito in Richardson Bay and the tip of the Tiburon Peninsula (approximately 11 kilometers [7 miles] northwest of the project area) and as far south as the San Bruno Shoals area (approximately 23 kilometers [14 miles] southwest of the project area). Gray whales have been observed foraging in these areas. Observations have typically been during the months from December to March, during their winter migration north to Alaska and the Bering Straits.

American Peregrine Falcon (*Falco peregrinus anatum*). Two pairs of peregrine falcons nest and roost on the SFOBB. One pair nests on the West Span and one pair on the East Span. Courtship behavior and other nesting activities can begin as early as December for these pairs. Eggs are usually laid in early March, and the young generally fledge in the third week of May. This species has been removed from federal listing, but is still protected by the Migratory Bird Treaty Act and the California Endangered Species Act (CESA).

Saltmarsh Common Yellowthroat (*Geothlypis trichas sinuosa*). The saltmarsh common yellowthroat inhabits fresh and brackish wetland areas as well as upland habitat throughout the San Francisco Bay Area. Saltmarsh common yellowthroats use the Emeryville Crescent as wintering habitat. Observations of three individuals perched on marsh gumplant (*Grindelia stricta*) located adjacent to the SFOBB Toll Plaza were made in December 1989 by Caltrans. The saltmarsh common yellowthroat is a species of concern under the State and Federal Endangered Species Acts.

Alameda Song Sparrow (*Melospiza melodia pusillula*). The Alameda song sparrow prefers fresh, brackish, and salt marsh habitats. Alameda song sparrow occurs in coastal salt marsh habitat at the Emeryville Crescent, adjacent to the SFOBB Toll Plaza. There have been no observations of the Alameda song sparrow nesting in the project area; however, marsh gumplant, which occurs on the north side of the Oakland Touchdown and the YBI, may provide nesting habitat for the Alameda song sparrow. The Alameda song sparrow has been observed perching on individual gumplants within the project area. The Alameda song sparrow is designated as a species of concern under the Federal Endangered Species Act. The CESA does not address the Alameda song sparrow.

Double-crested Cormorant (*Phalacrocorax auritus*). This species breeds in dense colonies that can be found on rocky coasts and offshore islands, as well as on inland lakes and rivers. Cormorants have the ability to nest at any time during the breeding season if the first nesting attempt is unsuccessful. Therefore, nests may be active any time between March and September. Double-crested cormorants have nested on the East Span of the SFOBB since 1984. The colony of double-crested cormorants includes 400 to 600 nesting pairs and represents the second-largest colony in Northern California. The highest concentrations of nesting pairs occur between

Columns E5 and E15. The double-crested cormorant is designated as a species of special concern under the CESA.

California Brown Pelican (*Pelecanus occidentalis californicus*). The California brown pelican is known to rest on bridge footings and forage within the project area. No known nest sites occur in the project area. The California brown pelican is listed as endangered under both the State and Federal Endangered Species Acts.

Allen's hummingbird *(Selasphorus sasin).* Allen's hummingbird nests in riparian, eucalyptus and cypress groves, evergreen, redwood, bushop pine forests and coastal scrub. It is found in the Bay Area from late January through July. Nesting habitat exists in the northern coastal scrub on YBI. This species is listed as a federal species of concern.

White-tailed kite *(Elanus leucurus).* White-tailed kites are present year-round in the Bay Area, although the population increases from September through May. Kites forage in low marsh vegetation, riparian grasslands, and agricultural areas and nest in moderately tall trees such as oaks and willows. Potential nesting habitat is present in the coast live oak woodland on YBI and foraging habitat is present in the Emeryville Crescent, outside of the project area. This species is listed as a federal and state species of concern.

American bittern *(Botaurus lentiginosus).* American bitterns are rare breeders in the Bay; there are no definitive breeding records for brackish and saltwater marshes in coastal California. They forage in cattail and tule marshes and other dense marsh vegetation. Dense marsh vegetation exists within the Emeryville Crescent, outside the project area. This species is listed as a federal species of concern.

Common loon *(Gavia immer).* The common loon nests in freshwater marshes, although it also forages and roosts in marine environments. This species has the potential to occur close to the Oakland. This species is listed as a federal and state species of concern.

Long-billed curlew *(Numenius americanus).* The long-billed curlew is a shorebird that is a federal species of concern. It does not breed in the Bay area, but it winters here. It is primarily a coastal species and is found in marshes and beaches. Therefore it could potentially forage in the project area.

Bank swallow *(Riparia riparia).* The bank swallow nests on rocky crags and cliffs. It breeds in California from late March to early May and is a rare winter visitor. Potential habitat for this species may be present along the slopes of YBI. This species is federally protected under the Migratory Bird Treaty Act and is listed as a state species of concern.

Elegant tern (*Sterna elegans).* The elegant tern nests in the Gulf of California, Baja California and southern California. It is a coastal bird and is frequently found in bays and esturaries. This species has the potential to occur in the project area along

the sand flats on the Oakland Touchdown. This species is listed as a federal and state species of concern.

Bewick's Wren *(Thryomanes bewickii).* Bewick's Wren, a federal species of concern, breeds in suburban environments, farms, shrubland and open woodlands. It tends to occur in a variety of dense, shrubby habitats, including coastal scrub habitats. It can be found year round in the Bay area. It has the potential to occur in the project area.

Western Snowy Plover (*Charadrius alexandrinus nivosus*). The western snowy plover is a small shorebird with pale coloration, making it almost completely camouflaged against a sandy background. This species remains in the state year-round where it populates open beach and coastal marsh areas. Snowy plovers have been designated as a threatened species under the Federal Endangered Species Act. The CESA includes the western snowy plover as a species of concern.

Appropriate breeding habitat for this species does not exist in the project area. The species forages over mudflats and sand flats. Sand flats are present in the area of the Oakland Touchdown for the northern alternatives (Figure 3-18 of Appendix A). Snowy plovers have not been observed in the project area.

Western Gull (*Larus occidentalis*). The western gull is protected under the Migratory Bird Treaty Act. Western gulls nest on the column footings of the SFOBB West Span and have the potential to nest on the footings of the East Span.[32]

Black-crowned Night Heron (*Nycticorax nycticorax*). The black-crowned night heron is protected under the Migratory Bird Treaty Act. The night heron nest and roost on YBI woodland. This species usually nests between February and July; however, it is unknown which trees might be used for nesting from year to year.

California Clapper Rail (*Rallus longirostris obsoletus*). The California clapper rail is a year-round resident of coastal salt marshes. Individuals hide their nests among a canopy of wetland vegetation dominated by pickleweed and cordgrass. This species is known to occur in the Emeryville Crescent area, located outside the study area. Appropriate nesting and foraging habitat does not exist in the study area. Both the State and Federal Endangered Species Acts include the clapper rail as an endangered species.

California Least Tern (*Sterna antillarum browni*). The California least tern nests in colonies on bare or sparsely vegetated areas near the coast. This species is found in the Bay Area during the breeding season from May through August. Nesting habitat which supports the California least tern does not occur within the study area. The California least tern is designated as an endangered species under both the State and Federal Endangered Species Acts.

[32] Caltrans, Letter from a Caltrans District 4 biologist regarding Western Gulls, July 1998.

Shorebirds. Shorebirds that are known to occur in the project area include western sandpiper (*Calidris mauri*) and black-bellied plover (*Pluvialis squatarola*). A strip of uplands at the former Oakland Army Base property located on the south side of the Oakland Touchdown is known to provide winter roosting habitat for shorebirds during high tides. As a result of development around the Central Bay, limited upland resting areas remain available for shorebird use during the winter season.

Central Valley and Central California-Coast Steelhead (*Oncorhynchus mykiss*). Steelhead, the anadromous form of rainbow trout, inhabit the Sacramento, Stanislaus, Tuolumne, and Merced Rivers and the mainstem of the San Joaquin River. The life history of steelhead is similar to that of chinook salmon, with two major differences. First, steelhead do not necessarily die after spawning, thus maintaining their ability to return to the Pacific Ocean after spawning in fresh water. Second, juvenile steelhead may spend up to four years residing in fresh water prior to migrating to the ocean as smolts. Typically, Sacramento steelhead migrate through San Francisco Bay and the Sacramento-San Joaquin Estuary from November through May after one year in fresh water.

Steelhead populations in the Central California Coast ESU (Evolutionary Significant Unit) and California Central Valley ESU have been listed by the NMFS as threatened under the Federal Endangered Species Act (62 No. 159). Steelhead migration periods are similar to the winter-run chinook salmon which inhabit shallow water habitat during foraging.

Winter-run, Fall-run, Spring-run Chinook Salmon (*Oncorhynchus tshawytscha*). Chinook salmon are anadromous, spending three to five years at sea before returning to fresh water to spawn. San Francisco Bay serves as a conduit through which adult salmon must pass to reach their upstream spawning grounds. Additionally, juvenile smolt salmon utilize the Bay as a migration corridor to reach the Pacific Ocean. Smoltification is the physiological acclimation of juvenile salmon to full-strength sea water which occurs after completion of the freshwater rearing phase. The chinook salmon population in San Francisco Bay and the Sacramento-San Joaquin Estuary is comprised of four races: fall-run, late fall-run, spring-run and winter-run. In addition, there are two Evolutionary Significant Units (ESUs), the Sacramento River ESU and the Central Valley ESU. Each of these spawning populations is distinguished based on the timing of adult upstream migration, spawning, and juvenile downstream migration. The Sacramento River winter-run ESU is federally listed as endangered, the Central Valley spring-run ESU is listed as federally threatened, and the Central Valley fall-run and late fall-run are listed as proposed threatened.

The federally endangered Sacramento River winter-run adult chinook salmon ESU migrates through San Francisco Bay and the Sacramento-San Joaquin River Estuary from December through April. Spawning is confined to the mainstem Sacramento River and occurs from mid-April through mid-July, peaking in May and June. Winter-run fry emerge from the gravel from July through October and rear to smoltification in the Sacramento River upstream from the Delta. However, in years of high Delta outflow, fry may migrate to the estuary. Generally, the period of peak outmigration through San Francisco Bay and the Sacramento-San Joaquin Estuary is between

January and April. The area of designated winter-run critical habitat includes all of San Francisco Bay north of the SFOBB.

The federally threatened and proposed endangered Central Valley spring-run chinook salmon ESU enters the Sacramento River from March to July and spawns from late August through early October, with a peak in September. The area of designated winter-run critical habitat includes all waters of San Pablo Bay westward of the Carquinez Bridge and all waters of San Francisco Bay (north of the SFOBB) from San Pablo Bay to the Golden Gate Bridge.

The proposed threatened Central Valley fall-run and late fall-run chinook salmon ESU enters the Sacramento and San Joaquin Rivers from July through April and spawns from October through February. Both runs exhibit an ocean-type life history, migrating as fry, subyearlings, and yearlings. Winter-run, spring-run, and fall-run chinook salmon have the potential to occur in the study area.

Green Sturgeon (*Acipenser medirostris*) and Longfin Smelt (*Sprinchus thaleichtys*). Habitat for the green sturgeon and longfin smelt does not occur in the project study area; however, it has the potential to occur during years of high amounts of rain. The green sturgeon is a species of special concern under the CESA. Its standing under the federal act is similar and the species is identified as a species of concern.

Pacific Herring (*Clupea pallasi*). Pacific herring is a small schooling marine fish which enters estuaries and bays to spawn. Pacific herring is both a popular sport fish and a commercially important species and as such is protected under the Magnuson-Stevens Act. Adult Pacific herring are seasonally abundant from October to March (the spawning season), and juvenile herring may linger in San Francisco Bay for several months after hatching. Large pre-spawning aggregations can be found in the deepwater channels of the central San Francisco Bay. Pacific herring then move into shallower areas to spawn.

Pacific herring are known to spawn throughout the intertidal and subtidal habitats within the vicinity of the project area, including eelgrass beds, on intertidal riprap along the shoreline, pilings, and seaweed, the Oakland harbor area, Alameda Island, and all around Treasure Island and YBI.

Early life stages of herring development are sensitive to environmental and human-induced stress, including non-suitable levels of water temperature, salinity, dissolved oxygen concentrations, suspended sediments, toxic contaminants, and sound pressure waves.

Table 3.9-2 Special Status Plant Species Potentially Occurring in the Vicinity of the SFOBB East Span Seismic Safety Project (Page 1 of 7)

Species and Common Name	Status			Flowering Period	Potential for Occurrence[e]
	Federal[a]	State[b]	CNPS[c] R-E-D[d]		
Amsinckia grandiflora large-flowered fiddleneck	E	E	1B 3-3-3	April-May	Not present; no supporting habitat
Arabis blepharophylla coast rock cress	--	--	4 1-1-3	Feb.-April	Not present; no supporting habitat
Arctostaphylos hookeri ssp. *ravenii* Presidio manzanita	E	E	1B 3-3-3	Feb.-March	Not present; no supporting habitat
Arctostaphylos hookeri ssp. *franciscana* San Francisco manzanita	SC	--	1A none	Feb.-April	Not present; no supporting habitat
Arctostaphylos pallida pallid manzanita	T	E	1B 3-3-3	Dec.-March	Not present; no supporting habitat
Arctostaphylos tomentosa ssp. *rosei* shaggy-barked manzanita	--	--	Proposed listing	Dec.-March	Not present; no supporting habitat
Arenaria paludicola marsh sandwort	E	E	1B 3-3-2	May-August	Not present; no supporting habitat
Astragalus tener var. *tener* alkali milk-vetch	SC	--	1B 3-2-3	March-June	Not present; no supporting habitat
Atriplex cordulata heartscale	SC	--	1B 2-2-3	May-October	Not present; no supporting habitat
Atriplex depressa brittlescale	SC	--	1B 2-2-3	May-October	Not present; no supporting habitat
Atriplex joaquiniana valley spearscale	SC	--	1B 2-2-3	April-Sep.	Not present; no supporting habitat

Abridged Notes:
Federal and State: **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** - Proposed Threatened; **SC** - Species of Concern; **C** – Candidate; **--** - Not listed.
CNPS: **1B** - Rare, threatened, or endangered in California and elsewhere; **2** - Rare, threatened, or endangered in California, but more common elsewhere; **3** - More information is needed to assign them to another list or to reject them from being listed; **4** - Limited distribution in California.
R-E-D: Three classes or degrees of concern, 1, 2, or 3 (higher numbers indicate greater concern): **Rarity** - extent of the plant's distribution and number of individuals; **Endangerment** - plant's vulnerability to extinction; **Distribution** - overall range of the plant.

Table 3.9-2 Continued (Page 2 of 7)

***Species* and Common Name**	**Status**			**Flowering Period**	**Potential for Occurrence[e]**
	Federal[a]	**State[b]**	**CNPS[c] R-E-D[d]**		
Carex comosa bristly sedge	--	--	2 3-3-1	May-Sep.	Not present; no supporting habitat
Chorizanthe cuspidata var. *cuspidata* San Francisco Bay spineflower	SC	--	1B 2-2-3	April-July	Unlikely; not observed during surveys
Chorizanthe robusta var. *robusta* robust spineflower	E	--	1B 3-3-3	May-Sep.	Unlikely; not observed during surveys
Cirsium fontinale var. *campylon* Mt. Hamilton thistle	SC	--	1B 2-2-3	April-Oct.	Not present; no supporting habitat
Cirsium occidentale var. *compactum* compact cobweb thistle	SC	--	1B 2-2-3	April-June	Not present; no supporting habitat
Clarkia concinna ssp. *automixa* South Bay clarkia	SC	--	4 1-1-3	April-July	Not present; no supporting habitat
Collinsia corymbosa round-headed Chinese houses	--	--	1B 2-2-3	April-June	Not present; no supporting habitat
Clarkia franciscana Presidio clarkia	E	E	1B 3-3-3	May-July	Not present; no supporting habitat
Collinsia multicolor San Francisco collinsia	--	--	4 1-1-3	March-May	Not present; marginal habitat present
Cordylanthus maritimus ssp. *palustris* Pt. Reyes bird's beak	SC	--	1B 2-2-3	April-May	Unlikely; not observed during surveys
Cordylanthus mollis ssp. *hispidus* hispid bird's-beak	SC	--	1B 2-3-3	June-Sep.	Not present; no supporting habitat

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Table 3.9-2 Continued (Page 3 of 7)

Cordylanthus palmatus palmate-bracted bird's-beak	E	E	1B 3-3-3	May-Oct.	Not present; no supporting habitat
Deinandra bacigalupii Livermore tarplant	SC	--	1B 3-2-3	June-Nov.	Not present; no supporting habitat
Delphinium californicum ssp. *interius* interior California larkspur	SC	--	1B 3-2-3	April-June	Not present; no supporting habitat
Delphinium recurvatum recurved delphinium	SC	--	1B 2-2-3	March-May	Not present; no supporting habitat
Erysimum franciscanum San Francisco wallflower	SC	--	4 1-2-3	March-June	Not present; no supporting habitat
Eschscholzia rhombipetala diamond-petaled poppy	SC	--	1B 3-3-3	March-April	Not present; no supporting habitat
Fritillaria falcata talus fritillary	SC	--	1B 3-2-3	March-May	Not present; no supporting habitat
Fritillaria lilacea fragrant fritillary	SC	--	1B 1-2-3	Feb.-April	Not present; no supporting habitat
Gilia capitata ssp. *chamissonis* dune gilia	--	--	Proposed listing	May-July	Unlikely; not observed during surveys
Gilia millefoliata many-stemmed gilia	--	--	Proposed listing	April-June	Not present; marginal habitat present
Grindelia hirsutula var. *maritima* San Francisco gumplant	SC	--	1B 2-2-3	Aug.-Sep.	Unlikely; not observed during surveys
Grindelia stricta var. *angustifolia* marsh gumplant	--	--	4 1-1-3	Aug.-Oct.	Present
Helianthella castanea Diablo rose-rock	SC	--	1B 3-2-3	April-June	Not present; no supporting habitat

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Table 3.9-2 Continued (Page 4 of 7)

***Species* and Common Name**	**Status**			**Flowering Period**	**Potential for Occurrence[e]**
	Federal[a]	**State[b]**	**CNPS[c] R-E-D[d]**		
Hemizonia parryi ssp. *congdonii* pappose spikeweed	SC	--	1B 3-3-3	June-November	Not present; no supporting habitat
Hesperolinon congestum Marin dwarf-flax	T	T	1B 3-3-3	May-July	Not present; no supporting habitat
Holocarpha macradenia Santa Cruz tarplant	T	E	1B 2-3-3	June-Oct.	Unlikely; not observed during surveys
Horkelia cuneata ssp. *sericea* Kellogg's horkelia	SC		1B 3-3-3	April-Sep.	Unlikely; not observed during surveys
Lasthenia conjugens Contra Costa goldfields	E	--	1B 3-3-3	March-June	Not present; no supporting habitat
Lathyrus jepsonii var. *jepsonii* delta-tule pea	SC	--	1B 2-2-3	May-June	Not present; no supporting habitat
Layia carnosa beach layia	E	E	1B 3-3-3	May-July	Not present; no supporting habitat
Lessingia germanorum San Francisco lessingia	E	E	1B 3-3-3	Aug.-Nov.	Unlikely; not observed during surveys
Lilaeopsis masonii Mason's lilaeopsis	SC	Rare	1B 2-3-3	April-Oct.	Not present; no supporting habitat
Lilium maritimum coast lily	SC	--	1B 2-3-3	May-July	Not present; no supporting habitat
Linanthus grandiflorus large-flowered linanthus	--	--	4 1-2-3	April-July	Not present; no supporting habitat
Microseris paludosa marsh microseris	--	--	Proposed listing	May-June	Not present; marginal habitat present

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Table 3.9-2 Continued (Page 5 of 7)

***Species* and Common Name**	**Status**			**Flowering Period**	**Potential for Occurrence[e]**
	Federal[a]	**State[b]**	**CNPS[c] R-E-D[d]**		
Monardella undulata curly-leaved monardella	--	--	4 1-2-3	May-July	Unlikely; not observed during surveys
Myosurus minimus ssp. *apus* little mousetail	SC	--	3 2-3-2	March-June	Not present; no supporting habitat
Phacelia phacelioides Mt. Diablo phacelia	SC	--	1B 3-2-3	April-May	Not present; no supporting habitat
Piperia michaelii Michael's rein orchid	--	--	4 1-2-3	May-Aug.	Not present; marginal habitat present
Plagiobothrys chorisianus var. *chorisianus* Choris's popcorn flower	--	--	3 2-2-3	April-June	Not present; no supporting habitat
Plagiobothrys diffusus San Francisco popcornflower	SC	E	1B 3-3-3	April-June	Not present; no supporting habitat
Sanicula maritima adobe sanicle	SC	SC	1B 3-3-3	April-May	Not present; no supporting habitat
Sidalcea hickmanii ssp. *viridis* Marin checkermallow	SC	--	1B 3-1-3	May-June	Not present; no supporting habitat
Silene verecunda ssp. *verecunda* Mission Dolores campion	SC	--	1B 3-2-3	March-June	Unlikely; not observed during surveys
Streptanthus albidus ssp. *peramoenus* most beautiful (uncommon) jewelflower	SC	--	1B 2-2-3	April - June	Not present; no supporting habitat

Abridged Notes:
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Table 3.9-2 Continued (Page 6 of 7)

Suaeda californica California suaeda	E	--	1B 3-3-3	July-Oct.	Unlikely; not observed during surveys
Trifolium amoenum showy Indian clover	E	--	1B 3-3-3	April-June	Not present; no supporting habitat
Triphysaria floribunda San Francisco owl's-clover	SC	--	1B 2-2-3	April-May	Not present; no supporting habitat
Tropidocarpum capparideum caper-fruited tropidocarpum	SC	--	1A --	March-April	Not present; no supporting habitat

Source: Caltrans, April 2001.

Abridged Notes:
Federal and State: **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** - Proposed Threatened; **SC** - Species of Concern; **C** – Candidate; **--** - Not listed.
CNPS: **1B** - Rare, threatened, or endangered in California and elsewhere; **2** - Rare, threatened, or endangered in California, but more common elsewhere; **3** - More information is needed to assign them to another list or to reject them from being listed; **4** - Limited distribution in California.
R-E-D: Three classes or degrees of concern, 1, 2, or 3 (higher numbers indicate greater concern): **Rarity** - extent of the plant's distribution and number of individuals; **Endangerment** - plant's vulnerability to extinction; **Distribution** - overall range of the plant.

Table 3.9-2 Continued (Page 7 of 7)

Abbreviations:

[a] Federal

E - Listed as endangered under the Federal Endangered Species Act.
T - Listed as threatened under the Federal Endangered Species Act.
PE - Proposed as endangered under the Federal Endangered Species Act.
PT - Proposed as threatened under the Federal Endangered Species Act.
SC - Federal species of concern; USFWS lacks sufficient information to support a listing proposal.
C - Candidate species; USFWS has on file enough information to propose listing as endangered or threatened.
-- - Not listed.

[b] State

E - Listed as endangered under the California Endangered Species Act.
T - Listed as threatened under the California Endangered Species Act.
PE - Proposed as endangered under the California Endangered Species Act.
PT - Proposed as threatened under the California Endangered Species Act.
SC - California species of special concern.
-- - Not listed.

[c] California Native Plant Inventory Status (CNPS)

List 1B - Plants that are rare, threatened, or endangered in California and elsewhere.
List 2 - Plants that are rare, threatened, or endangered in California, but more common elsewhere.
List 3 - Plants about which more information is needed to assign them to another list or to reject them from being listed.
List 4 - Plants that are of limited distribution in California.

[d] R-E-D Code

This code is divided into three classes or degrees of concern, represented by the number 1, 2, or 3 (higher numbers indicate greater concern):

Rarity - addresses the extent of the plant's distribution and number of individuals.
Endangerment - addresses the plant's vulnerability to extinction.
Distribution - addresses overall range of the plant.

[e] Potential for Occurrence

Unlikely; not observed during surveys - suitable habitat for this species was identified in the project area; however, no observations were made during 1997 fall and 1998 spring surveys.
Present - plants of this species were found during surveys or are known to be present in the project area from literature reviews.
Not present; no supporting habitat - habitat that would support the presence of this species is not present in the project area.
Not present; marginal habitat present - marginal habitat that could support this species was found in the project area.

Table 3.9-3 Special Status Wildlife Species, Critical Habitat, and Economically Important Fish Potentially Occurring in the Vicinity of the SFOBB East Span Seismic Safety Project (Page 1 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
MARINE MAMMALS			
Arctocephalus townsendi Guadalupe fur seal	T	T	Not present; no supporting habitat
Balaenoptera borealis sei whale	E	--	Not present; no supporting habitat
Balaenoptera musculus blue whale	E	--	Not present; no supporting habitat
Balaenoptera physalus finback whale	E	--	Not present; no supporting habitat
Eschrichtius robustus gray whale	D, MMPA	--	Present in increasing numbers December to March near Richardson Bay and the Tiburon Peninsula
Eubalaena glacialis right whale	E	--	Not present; no supporting habitat
Eumetopias jubatus Steller sea lion	T	--	Unlikely to occur; no known occurrences in vicinity of project area
Eumetopias jubatus Steller sea lion critical habitat	T	--	Critical habitat is located in San Francisco County, but not in project area and species is not known to occur in vicinity of project area
Megaptera novaeangliae humpback whale	E	--	Not present; no supporting habitat

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 2 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Phoca vitulina harbor seal	MMPA	--	Present; haul-out site located 305 meters (1,000 feet) from nearest temporary construction limit
Physeter catodon sperm whale	E	--	Not present; no supporting habitat
Zalophus Californiaus California sea lion	MMPA	--	Present; haul-out site located 6 kilometers (4 miles) from project site
MAMMALS			
Corynorhinus townsendii townsendii Pacific western big-eared bat	SC	SC	Not present; no supporting habitat
Dipodomys heermanni berkeleyensis Berkeley kangaroo rat	SC	--	Not present; no supporting habitat
Eumops perotis californicus greater western mastiff-bat	SC	SC	Not present; no supporting habitat
Myotis ciliolabrum small-footed myotis bat	SC	--	Not present; no supporting habitat
Myotis evotis long-eared myotis bat	SC	SC	Not present; no supporting habitat
Myotis thysanodes fringed myotis bat	SC	SC	Not present; no supporting habitat
Myotis volans long-legged myotis bat	SC	SC	Not present; no supporting habitat

Abridged Notes:
Federal: **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 3 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Myotis yumanensis Yuma myotis bat	SC	SC	Not present; no supporting habitat
Neotoma fuscipes annectens San Francisco dusky-footed woodrat	SC	SC	Not present; no supporting habitat
Neotoma fuscipes riparia San Joaquin Valley woodrat	E	SC	Not present; no supporting habitat
Perognathus inornatus inornatus San Joaquin pocket mouse	SC	SC	Not present; no supporting habitat
Plecotus townsendii townsendii Pacific western big-eared bat	SC	SC	Not present; no supporting habitat
Reithrodontomys raviventris salt marsh harvest mouse	E	E	Not present; no supporting habitat
Scapanus latimanus parvus Alameda Island mole	SC	SC	Not present; no supporting habitat
Sorex vagrans halicoetes salt marsh vagrant shrew	SC	SC	Not present; no supporting habitat
Sylvilagus bachmani riparius riparian brush rabbit	E	E	Not present; no supporting habitat
Vulpes macrotis mutica San Joaquin kit fox	E	T	Not present; no supporting habitat

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 4 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Aquila chrysaetos golden eagle	--	SC	Not present; no supporting habitat
BIRDS			
Agelaius tricolor tricolored blackbird	SC	SC	Not present; no supporting habitat
Ammodramus savannarum grasshopper sparrow	SC	--	Not present; no supporting habitat
Amphispiza belli belli Bell's sage sparrow	SC	SC	Not present; no supporting habitat
Asio flammeus short-eared owl	SC	SC	Not present; no supporting habitat
Athene cunicularia hypugea burrowing owl	SC	SC	Not present; no supporting habitat
Botaurus lentiginosus American bittern	SC	--	Potential to occur; rare breeder in the Bay, although roosting habitat is present within the Emeryville Crescent, outside the project area
Branta canadensis leucopareia Aleutian Canada goose	D	--	Not present; no supporting habitat
Buteo regalis ferruginous hawk	SC	SC	Not present; no supporting habitat
Calypte costae Costa's hummingbird	SC	--	Not present; no supporting habitat

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 5 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Carduelis lawrencei Lawrence's goldfinch	SC	--	Not present; no supporting habitat
Chaetura vauxi Vaux's swift	SC	SC	Not present; no supporting habitat
Charadrius alexandrinus nivosus western snowy plover	T	SC	Unlikely to occur; feeding habitat along Oakland Touchdown, suitable nesting habitat not present
Charadrius montanus mountain plover	PT	SC	Not present; no supporting habitat
Chondestes grammacus lark sparrow	SC	--	Not present; no supporting habitat
Contopus cooperi olive-sided flycatcher	SC	--	Not present; no supporting habitat
Dendroica occidentalis hermit warbler	SC	--	Not present; no supporting habitat
Diomedea albatrus short-tailed albatross	PE	--	Not present; no supporting habitat
Elanus leucurus white-tailed kite	SC	SC	Potential to occur; feeding habitat in Emeryville Crescent outside project area, marginal nesting habitat present on YBI
Empidonax difficilis Pacific slope flycatcher	SC	--	Not present; no supporting habitat

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 6 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Empidonax trailii brewster little willow flycatcher	SC	--	Not present; no supporting habitat
Falco peregrinus anatum American peregrine falcon	D, MBTA	E	Present; nests between upper and lower bridge deck on Column E2
Gavia immer common loon	SC	SC	Potential to occur for foraging; nesting habitat not within the project area
Geothlypis trichas sinuosa saltmarsh common yellow throat	SC	SC	Potential to occur; nesting habitat within the Emeryville Crescent, outside the project area
Haliaeetus leucocephalus bald eagle	T	E	Not present; no supporting habitat
Lanius ludovicianus loggerhead shrike	SC	SC	Not present; no supporting habitat
Larus occidentalis western gull	MBTA	--	Present; nesting occurs on the column footings of the existing bridge
Laterallus jamaicensis black rail	SC	T	Unlikely to occur; supporting habitat present in Emeryville Crescent, adjacent to project area on Oakland side. Species not detected in project area during surveys

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 7 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Melanerpes lewis Lewis' woodpecker	SC	--	Not present; no supporting habitat
Melospiza melodia pusillula Alameda song sparrow	SC	--	Potential to occur; nesting habitat within the Emeryville Crescent, outside the project area
Numenius americanus long-billed curlew	SC	SC	Potential to occur
Nycticorax nycticorax black-crowned night heron	MBTA	--	Potential to occur; nesting habitat on YBI
Oceanodroma homochroa ashy storm-petrel	SC	SC	Not present; no supporting habitat
Pelecanus occidentalis californicus California brown pelican	E	E	Present (Seasonally) at Coast Guard Station and on bents
Phalacrocorax auritus double-crested cormorant	MBTA	SC	Present; nests on bridge below lower deck
Plegadis chihi white-faced ibis	SC	SC	Not present; no supporting habitat
Rallus longirostris obsoletus California clapper rail	E	E	Potential to occur; nesting habitat within the Emeryville Crescent, outside the project area
Riparia riparia bank swallow	MBTA	T	Potential to occur; nesting habitat present on YBI

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 8 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Selasphorus rufus rufous hummingbird	SC	--	Unlikely to occur; foraging and nesting requirements not present
Selasphorus sasin Allen's hummingbird	SC	--	Potential to occur; nesting habitat present on YBI
Sphyrapicus ruber red-breasted sapsucker	SC	--	Not present; no supporting habitat
Sterna antillarum browni California least tern	E	E	Potential to occur; observed feeding in waters outside of the project area
Sterna elegans elegant tern	SC	SC	Potential to occur
Synthliboramphus hypoleucus Xantus' murrelet	SC	SC	Not present; no supporting habitat
Thryomanes bewickii Bewick's wren	SC	--	Potential to occur
Toxostoma redivivum California thrasher	SC	--	Not present; no supporting habitat
REPTILES			
Anniella pulchra pulchra silvery legless lizard	SC	SC	Unlikely to occur; marginal habitat; no known occurrences in project area;
Caretta caretta loggerhead turtle	T	--	Unlikely to occur; no known occurrences in project area

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 9 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Chelonia mydas green sea turtle	T	--	Unlikely to occur; no known occurrences in project area
Clemmys marmorata marmorata northwestern pond turtle	SC	--	Not present; no supporting habitat
Clemmys marmorata pallida southwestern pond turtle	SC	--	Not present; no supporting habitat
Dermochelys coriacea leatherback turtle	E	--	Unlikely to occur; no known occurrences in project area
Lepidochelys olivacea olive ridley sea turtle	T	--	Unlikely to occur; no known occurrences in project area
Masticophis flagellum ruddocki San Joaquin coachwhip	SC	SC	Not present; no supporting habitat
Masticophis lateralis euryxanthus Alameda whipsnake	T (PE)	T	Not present; no supporting habitat
Phynosoma coronatum frontale California horned lizard	SC	SC	Not present; no supporting habitat
Thamnophis gigas giant garter snake	T	T	Not present; no supporting habitat
AMPHIBIANS			
Ambystoma californiense California tiger salamander	C	SC	Not present; no supporting habitat
Rana boylii foothill yellow-legged frog	SC	--	Not present; no supporting habitat

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 10 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Scaphiopus hammondii western spadefoot toad	SC	--	Not present; no supporting habitat
Rana aurora draytonii California red-legged frog	T	SC	Not present; no supporting habitat
FISH			
Acipenser medirostris green sturgeon	SC	SC	Present; supporting habitat outside of project area; likely to occur during high precipitation years
**Clupea harengeus* Pacific herring	--	--	Present; eelgrass spawning habitat in project area, piling, riprap
Eucyclogobius newberryi tidewater goby	E	SC	Unlikely to occur; spawning habitat not in project area
Hypomesus transpacificus delta smelt	T	T	Unlikely to occur; spawning habitat not in project area
Lampetra ayresi Pacific lamprey	SC	--	Not present; no supporting habitat
Lampetra ayresi river lamprey	SC	SC	Unlikely to occur; supporting habitat not in project area

* The Pacific herring is a commercial fish and is considered in this document because its population in the San Francisco Bay is monitored and a concern of the California Department of Fish and Game.

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 11 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Oncorhynchus kisutch Central California coast coho salmon ESU	T (PE)	E	Unlikely to occur; out of range
Oncorhynchus kisutch Southern Oregon/ Northern California coho salmon ESU	T	SC	Unlikely to occur; out of range
Oncorhynchus mykiss Central California coast steelhead ESU	T	SC	Present; shallow water foraging habitat in project area
Oncorhynchus mykiss Central-valley steelhead ESU	T	SC	Present; shallow water foraging habitat in project area
Oncorhynchus tshawytscha Sacramento Valley winter-run chinook salmon ESU	E	E	Present; supporting habitat in project area
Oncorhynchus tshawytscha Sacramento Valley winter-run chinook salmon ESU critical habitat	E	--	Present; the existing East Span of the SFOBB is considered the southern boundary of the critical habitat for the winter-run chinook
Oncorhynchus tshawytscha Central Valley fall-run and late fall-run chinook salmon ESU	PT	--	Present; supporting habitat in project area

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 12 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Oncorhynchus tshawytscha Central Valley fall-run and late fall-run chinook salmon ESU critical habitat	PT	--	The existing East Span of the SFOBB could be designated as southern boundary of critical habitat for fall-run chinook salmon
Oncorhynchus tshawytscha Central Valley spring-run chinook salmon ESU	PE	SC	Present; supporting habitat located within project area
Oncorhynchus tshawytscha Central Valley spring-run chinook salmon ESU critical habitat	T	T	The existing East Span of the SFOBB could be designated as southern boundary of critical habitat for spring-run chinook salmon
Pogonichthys macrolepidotus Sacramento splittail	T	SC	Unlikely to occur; supporting habitat not in project area
Sprinchus thaleichtys longfin smelt	SC	SC	Present; likely to occur only during high water levels
INVERTEBRATES			
Adela oplerella Opler's longhorn moth	SC	--	Not present; no supporting habitat
Brachinecta longiantenna longhorn fairy shrimp	E	--	Not present; no supporting habitat
Brachinecta lynchi vernal pool fairy shrimp	T	--	Not present; no supporting habitat
Cicindela hirticollis gravida sandy beach tiger beetle	SC	--	Not present; no supporting habitat

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 13 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Coelus globosus globose dune beetle	SC	--	Not present; no supporting habitat
Euphydryas editha bayensis bay checkerspot butterfly	T	--	Not present; no supporting habitat
Haliotes cracherodii Black abalone	C	--	Not present; no supporting habitat
Haliotes sorenseni white abalone	PE	--	Not present; no supporting habitat
Helminthoglypta nickliniana bridgesi Bridges' Coast Range shoulderband snail	SC	--	Unlikely to occur; no known occurrences in project area
*Hydrochara ricksecker*i Ricksecker's water scavenger beetle	SC	--	Not present; no supporting habitat
Hygrotus curvipes curved-foot hygrotus diving beetle	SC	--	Unlikely to occur; no known occurrences in project area
Icaricia icarioides missionensis mission blue butterfly	E	--	Unlikely to occur; marginally supporting habitat in project area. Species not observed during surveys
Incisalia mossii bayensis San Bruno elfin butterfly	E	--	Not present; no supporting habitat

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 14 of 15)

***Species* and Common Name**	**Status**		**Potential for Occurrence[c]**
	Federal[a]	**State[b]**	
Lepidurus packardi vernal pool tadpole shrimp	E	--	Not present; no supporting habitat
Lichnanthe ursina bumblebee scarab beetle	SC	--	Not present; no supporting habitat
Linderiella occidentalis California linderiella fairy shrimp	SC	--	Not present; no supporting habitat
Nothochrysa californica San Francisco lacewig	SC	--	Not present; no supporting habitat
Speyeria callippe callippe Callippe silverspot butterfly	E	--	Not present; no supporting habitat

Source: Caltrans, April 2001.

Abridged Notes:
Federal: : **E** – Endangered; **T** – Threatened; **PE** - Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **C** – Candidate; **D** – Delisted; **MMPA** - Marine Mammal Protection Act; **MBTA** – Migratory Bird Treaty Act; **--** – Not listed.
State: **E** – Endangered; **T** – Threatened; **PE** – Proposed Endangered; **PT** – Proposed Threatened; **SC** – Species of Concern; **--** – Not listed.

Table 3.9-3 Continued (Page 15 of 15)

Abbreviations:

[a] Federal

E - Listed as endangered under the Federal Endangered SpeciesAct.
T - Listed as threatened under the Federal Endangered Species Act.
PE - Proposed as endangered under the Federal Endangered Species Act.
PT - Proposed as threatened under the Federal Endangered Species Act.
SC - Federal species of concern; USFWS lacks sufficient information to support a listing proposal.
C - Candidate species for which the USFWS has on file enough information to propose listing as endangered or threatened.
D - Delisted. Status to be monitored for 5 years.
MMPA - These species are protected under the Marine Mammal Protection Act.
MBTA - These species are protected under the Migratory Bird Treaty Act.
-- - Not listed.

[b] State

E - Listed as endangered under the California Endangered Species Act.
T - Listed as threatened under the California Endangered Species Act.
PE - Proposed as endangered under the California Endangered Species Act.
PT - Proposed as threatened under the California Endangered Species Act.
SC - California Department of Fish and Game Species of Concern.
-- - Not listed.

[c] Potential for Occurrence

Unlikely to occur - suitable habitat for this species was identified in the project area. However, the species is unlikely to occur due to its general avoidance of disturbed areas, lack of historic or recent occurrences near the project area, or the presence of only marginally suitable habitat.
Present - individuals of this species were found during surveys or are known to be found in the project area from literature reviews.
Not present; no supporting habitat - habitat that would support the presence of this species is not present in the project area.

3.10 HISTORIC AND CULTURAL RESOURCES

3.10.1 Regulatory Context

A cultural resources investigation was conducted in accordance with Section 106 of the National Historic Preservation Act and implementing regulations (36 CFR 800) to document the findings summarized below. On February 18, 1998, Caltrans, in conjunction with the FHWA, established an Area of Potential Effect (APE) wide enough to include all project alternatives, design options, and potential construction easements. The area was surveyed to identify cultural resources including archaeological and historic sites or properties. Accordingly, an Archaeological Survey Report (ASR), Historic Architecture Survey Report (HASR), Historic Property Survey Report (HPSR), Finding of Effect for Archaeological Resources, and Finding of Adverse Effect: Buildings and Structures were prepared for review by the State Historic Preservation Officer (SHPO). Additional reports completed after publication of the DEIS include the Addendum Archaeological Survey Report — Maritime Archaeology, the Addendum Finding of Adverse Effect, and Consideration of Proposed Mitigation Measures for Project Effects on Historic Buildings and Structures.

Cultural resources investigations for the East Span Project build on previous research conducted in 1997 by the Navy for the Naval Station Treasure Island Disposal and Reuse Project and prior Caltrans investigations for seismic retrofit work on the existing SFOBB published in 1997. These investigations and research for the East Span Project have identified cultural resources that are either listed or determined eligible for listing on the National Register of Historic Places (NRHP). The SHPO has concurred with the findings of these previous investigations and with the eligibility evaluations prepared for the East Span Project.

On June 17, 1999, revised Section 106 regulations became effective. The revised regulations, issued by the Advisory Council on Historic Preservation, replace the 1986 procedures. The new regulations significantly modify the Section 106 review process, introducing new streamlining while incorporating statutory changes mandated by the 1992 amendments to the National Historic Preservation Act (NHPA). The historic resource evaluation work conducted for the East Span Project prior to June 1999 followed the previous Section 106 regulations. All work done after June 1999 followed the current Section 106 regulations.

The evaluation of NRHP eligibility is made by applying the Criteria of Evaluation codified in 36 CFR 60.4 as follows:

- The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that:

    a. Are associated with events that have made a significant contribution to the broad patterns of our history; or

b. Are associated with the lives of persons significant in our past; or

c. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant distinguishable entity whose components may lack individual distinction; or

d. Have yielded or may be likely to yield information important in history or prehistory.

Properties are eligible or listed at the local, state, or national level of significance.

The results of archaeological and historic architectural investigations pursuant to the National Preservation Act are presented in the following sections.

3.10.2 Archaeological Resources

One archaeological site, CA-SFr-04/H, which has both a prehistoric and historic component, has been recorded within the APE. The prehistoric component of this site is a contributing element to the eligibility of the site under Criterion D. Native American burials were reported to have been removed from this site by the University of California in 1934. Since CA-SFr-04/H has contained and may again yield human remains, its significance may extend beyond Criterion D.

The historic component of CA-SFr-04/H related to the Naval Training Station was determined to be a non-contributing element for eligibility to the National Register. Archival research does indicate, however, that there is a potential for eligible historical archaeological resources within the APE which are related to the American Period and associated with the presence of the Army Post and Depot and civilian occupation. The SHPO concurred with these findings on August 13 and 21, 1998 (see its letters in Appendix G). These potential archaeological features and their contents are valuable for what can be learned through data recovery and have no value for preservation in place. See Appendix G for SHPO views on eligibility.

The Treatment Plan, discussed in Chapter 4, will identify research questions in the archaeological research design that could be addressed by data that the historic property is likely to contain. Features will be evaluated first for integrity. The level of integrity necessary to qualify examples of various property types for the NRHP under Criterion D is measured by their ability to contain the types of data necessary to contribute to the research issues identified in the research design.

Archaeological features with documented associations and a range and quantity of artifacts are among the most important potential sources of data that can be used to address the research questions. Each feature will be evaluated using the following principles:

1) Association: Does the deposit have reliable and precise historical associations?

2) Integrity: Has the site been disturbed and to what degree?

3) Materials: Are there sufficient number and variety of types of artifacts?

4) Stratigraphy: Is there discrete vertical and horizontal stratification? and

5) Relative Rarity: Remains from a social, ethnic, or economic group that is poorly represented in the sample universe will be more important because of its rarity than remains that relate to a well-represented group.

A field test of CA-SFr-04/H was conducted in March 1998. The purpose of the field test was to examine the integrity of the prehistoric component and establish vertical and horizontal boundaries of the site. The site is represented by a well-defined prehistoric midden deposit capped by a fill layer of variable thickness that is, in turn, capped by an asphalt surface. Despite previous impacts to the midden deposit during construction of the Naval Training Station and the Bay Bridge, computer modeling suggests that 1,560 cubic meters (5,520 cubic feet) of midden with high integrity remains beneath the existing asphalt surface.

Yerba Buena Island (YBI) was occupied at times by members of the *Huchiun* tribelet of the Ohlone (Costanoan) group. Prior to a field test of CA-SFr-04/H in March 1998, the Native American Heritage Commission provided a list of interested Native Americans to contact. All parties on the list were contacted to seek information or concerns they might have about this site and to identify any issues they would like to see addressed in the Treatment Plan. A Native American monitor was on site during the archaeological field test investigations. Coordination will continue with interested Native Americans.

No historic or prehistoric archaeological resources were identified within the Oakland Touchdown area of the APE, and this area is considered to possess no archaeological sensitivity. Refer to Appendix G for the views of the SHPO on archaeological resources (letters dated August 13 and 21, 1998).

Archival research revealed the possibility of submerged cultural resources within the proposed project area in San Francisco Bay, including the possibility of four sunken ships. An APE was defined within the Bay with a total area of 380 hectares (940 acres) The APE includes the existing alignment, proposed alignments of the new East Span, Clipper Cove, an area east of Building 262, and a corridor 366 meters (1,200 feet) to either side of the existing bridge, which may be disturbed by dredging activities and anchor drag during construction activities.

A Phase 1 Maritime Archaeological Survey Report was completed in February 2000 to determine if any of these submerged resources are within the APE. A sonar survey of the APE did not reveal the presence of any remains of shipwrecks. However, the sonar survey did disclose the remains of the Key System Ferry Terminal. The remains of the ferry terminal were determined not to be a contributing element to the Key System railway or the Key Pier Substation. SHPO concurred with these findings on June 6, 2000. See Appendix G for SHPO views on eligibility of maritime resources.

3.10.3 Historic Architectural Resources

Archival research and field investigations were conducted for the East Span Project and documented in a Historic Architecture Survey Report. Based on these investigations, NRHP-listed and NRHP-eligible resources have been identified within the APE as defined for the build alternatives. Listed and eligible resources are described below and identified on Figures 3-21 and 3-22 in Appendix A.

San Francisco-Oakland Bay Bridge (SFOBB)

The SFOBB, completed in 1937, is a double-deck structure carrying five lanes of traffic on each level (see Section 1.3.1 — The San Francisco-Oakland Bay Bridge and Figure 1-1 in Appendix A for a (description of the SFOBB). The SFOBB was determined eligible for listing on the NRHP in 1983. An evaluation was prepared by Caltrans as part of the Historic Property Survey Report (HPSR) for the I-280 Transfer Concept Program. The evaluation concluded that the SFOBB is eligible for listing on the NRHP under Criteria A, B, and C at the national level of significance. The SHPO reviewed this documentation and concurred with the determination that the SFOBB is eligible for inclusion on the NRHP.

On August 6, 1999, the State Historical Resources Commission approved the nomination of the SFOBB for listing on the NRHP, and the nomination was forwarded to the SHPO. In December of 1999, the SHPO forwarded the nomination to the Keeper of the NRHP. The Keeper has subsequently requested additional descriptive information; the listing of the SFOBB on the NRHP is still pending. It is also a protected Section 4(f) resource, as determined by FHWA (see Section 6.3.1 — Section 4(f) Evaluation, The San Francisco-Oakland Bay Bridge).

The property includes entrance and exit ramps connected to the western approach and the elevated bus ramps that connect the western approach to the Transbay Transit Terminal at Mission Street between First and Fremont Streets. Twin-towered suspension spans extend from San Francisco to YBI and are connected by a massive center anchorage. On YBI, there are concrete viaducts at either end of a double-deck tunnel. Continuing eastward from the island, a series of steel truss spans carries the highway across the eastern portion of the Bay.

The lower deck of the bridge originally carried two tracks for electric streetcars in addition to three lanes for trucks, while the upper deck carried five lanes for automobiles. Rail service was terminated in 1958, and the bridge was altered to its present configuration of five traffic lanes on each level. Substantial alterations were also made to the YBI tunnel and its approaches at that time. The other major alteration of the structure occurred on the western approach ramps in San Francisco, with the construction of the freeway system in the late 1950s. This work altered much of the upper deck approach ramp between First and Fifth Streets. Maintenance work over the years and repairs made after earthquakes have resulted in other changes to the structure, but the bridge as a whole retains sufficient integrity to be listed on the NRHP.

At the time the SFOBB was first opened in 1936, it held many world records. It was the greatest bridge in the world for its cost, length, quantities of steel and concrete, weight,

depth, and number of piers, the size of the bore of the tunnel on YBI, and the versatility of its engineering. Seven of its piers were deeper than any others in the world. New technologies were developed to construct the foundations. The submarine work was the greatest underwater engineering task ever undertaken. The steel for the superstructure was said to constitute the largest steel order ever placed.

Four buildings associated with the SFOBB and included in the nomination as contributors to the entire bridge are located within the project APE. These four buildings are: the Caltrans garage on YBI, the Caltrans electrical substations on YBI and at the Oakland Touchdown, and the Key Pier Substation at the Oakland Touchdown. The Caltrans garage was constructed in the late 1930s as an integral component to the SFOBB. The building is constructed of reinforced concrete (see Figure 3-23 in Appendix A). The Caltrans electrical substations are reinforced concrete structures that were constructed in the 1930s as an integral component to the SFOBB (see Figures 3-23 and 3-24 in Appendix A). The Key Pier Substation is a reinforced concrete structure that was constructed in 1926 (see Figure 3-24 in Appendix A). It was not built as a component of the SFOBB; however, it was incorporated into the bridge operation to supply power for the trains crossing the bridge. It is a contributing component of the SFOBB. It is also individually eligible for the National Register at the local level of significance under Criterion A as a rare surviving component of the historically significant Key System railway, which was an important East Bay transit system in the early 20th century.

Senior Officers' Quarters Historic District (includes Quarters 1 to 7 and Buildings 83, 205, and 230)

The Senior Officers' Quarters Historic District (the district) was identified as a property eligible for the National Register of Historic Places in a historic architecture survey of Yerba Buena and Treasure Islands carried out by the Navy in 1997. The district is eligible for the National Register at the local level of significance under Criteria A and C, in the areas of military history and architecture. These criteria may be applied to historic districts as well as individual historic properties; in general terms, a historic district contains a number of historic buildings, structures, or sites that are united historically, culturally, or architecturally, and that, as an assemblage, meet the National Register criteria of significance.

The district is comprised of Quarters 1 through 7 and three associated garages (Buildings 83, 205, and 230) (see Figure 3-21 in Appendix A). The seven residences are all of wood frame construction, with two full floors and dormered attic stories (see Figure 3-25 in Appendix A). They were constructed between 1900 and 1903 in the Classical Revival style. Quarters 1, the largest and most elaborate of these, was listed on the National Register of Historic Places in 1991. It is individually listed in NRHP at the state level of significance under Criteria A and C (see Figure 3-25 in Appendix A). Buildings 83 and 230, constructed in 1918 and 1944, respectively, both have second floor living quarters. Building 205 is a single-story garage constructed in 1936. The district is significant for its association with the Naval Training Station on YBI and as a distinctive ensemble of Classical Revival residences.

The District Record prepared by the Navy for the historic district states that "the boundaries were determined to include the historic buildings of the area, and the landscape elements that tie them together." The boundaries of this roughly triangular historic district are the road to the west of Quarters 5 and 6, the lower edge of the lawn area to the east, and a line up the hill behind Quarters 1 that encompasses the formal gardens between Quarters 1 and Building 230.

Quarters 8

USCG Quarters 8 (previously owned by the Navy) is a three-story residence of Mediterranean design, built of wood with a stucco exterior on the first two floors (see Figure 3-26 in Appendix A). It was constructed in 1905 as the home of the commander of the Marine Corps detachment assigned to YBI. The property is eligible for the NRHP at the local level of significance under Criteria A and C, in the areas of military history and architecture. The house is historically significant as one of the few extant buildings from the early 20th century associated with the Naval Station on YBI and the last remaining building associated with the Marine Corps' presence on the island. It is also architecturally significant as the work of prominent San Francisco architects James and Merritt Reid.

Quarters 9

USCG Quarters 9 (previously owned by the Navy) is a 1-1/2-story residence of wood-frame construction (see Figure 3-27 in Appendix A). The property is eligible for the NRHP at the local level of significance under Criteria A and C, in the areas of military history and architecture. It was built ca. 1916 as the residence for the civilian "master of tugs" and is the only extant building on YBI constructed for a civilian employee of the Navy. It is also one of the few surviving buildings on the island from the period of extensive growth of the Naval Station in the years before and during U.S. involvement in World War I.

Quarters 10

Naval Quarters 10 is a two-story, wood-frame residence constructed in 1948 (see Figure 3-28 in Appendix A). The property is eligible under NRHP Criterion C at the local level of significance for its architecture (Bay Area modernism). The historic property includes the garage, Building 267, which was constructed at the same time as the house and is included as a contributing component of the historic resource.

Building 262

Building 262 (often referred to as "the torpedo building"), at the eastern end of YBI, is a reinforced concrete building with a gable roof clad in corrugated metal (see Figure 3-29 in Appendix A). The property is eligible for the NRHP at the state level of significance under Criteria A and C, in the areas of military history and architecture. It was constructed for the U.S. Army in 1891, to manufacture and store mines used in coastal defenses. The building is historically significant as the only extant building associated with the 19th century Army presence on YBI. It is also significant architecturally as a pioneering example of reinforced concrete construction, a building technique that was still in its infancy in 1891.

Other Properties

No other historic properties exist within the APE. There are no California Historical Landmarks, California Points of Historical Interest, or city-designated landmarks within the APE. NRHP historic districts exist in proximity to the East Span Project APE but would not be affected by the proposed action and, thus, were not included in the APE. The USCG historic district is located to the southwest and outside the APE on YBI and would not be affected by the project. The Oakland Army Base historic district is located to the east of the APE at the Oakland Touchdown area and would not be affected by the project. Located on TI, outside of the APE, are Buildings 1, 2, and 3. All three buildings, which are eligible for listing on the NRHP, were constructed in 1939 and used in the Golden Gate International Exposition.

Concurrence

Consultation was initiated with the SHPO in June 1998, concerning eligibility of resources within the APE for the East Span Project. The SHPO responded in a letter dated August 13, 1998 (see Appendix G: Agency Consultation Letters), and concurred with National Register eligibility for Quarters 10, Navy Building 267 (the garage for Quarters 10), the Bay Bridge Oakland Substation, and the Key Pier Substation. The SHPO had concerns about the pre-1948 buildings that were considered ineligible and requested information evidencing that FHWA solicited the comments of the Navy and USCG on the eligibility of these properties. Caltrans addressed this concern, and the SHPO responded in a letter dated August 21, 1998, concurring that the buildings are not eligible (a copy of the August 21 letter can be found in Appendix G). In addition, in a letter from the SHPO regarding the proposed retrofit of the SFOBB dated August 13, 1997 (see Appendix G), the SHPO concurred that the YBI Electrical Substation and the Caltrans garage on YBI are eligible for the NRHP because they are contributors to the SFOBB as a whole.

In summary, there are nine historic properties in the APE that were assessed for effects:

1) Archaeological site CA-SFr-04/H (eligible);
2) SFOBB and contributing components (eligible; in process of being listed);
3) Key Pier Substation (contributing to SFOBB; also individually eligible);
4) Senior Officers' Quarters Historic District (eligible);
5) Quarters 1 (listed);
6) Quarters 8 (eligible);
7) Quarters 9 (eligible);
8) Quarters 10 (eligible); and
9) Building 262 (eligible).

3.11 SCIENTIFIC RESOURCES

Paleontologic resources, typically vertebrate or invertebrate fossilized remains, are afforded federal protection under 40 CFR 1508.27 as a subset of scientific resources. California Public Resources Code Section 5097.5 provides for protection of paleontological sites and features on public lands. Paleontologic resources may exist within the project APE in sediments underlying San Francisco Bay. A mammoth tooth was discovered in the 1930s within Bay sediments during construction of the existing SFOBB East Span at Pier E11. California Public Resources Code Section 5097.5 mandates that "No person shall knowingly and willfully excavate upon, or remove, destroy, injure, or deface, any...vertebrate paleontological site, including fossilized footprints...or any other paleontological...feature, situated on public lands, except with the express permission of the public agency having jurisdiction over the lands." Typically, the State Lands Commission is the designated public agency with jurisdiction. To comply with the California Public Resources Code, Caltrans would use its policy in the "Interim Guidance for the Identification, Assessment, and Treatment of Paleontological Resources," July 1991. The guidance was developed based on the "1982 Bureau of Land Management Grand Junction District, Colorado: Draft Paleontological Instruction Memo."

3.12 DISPOSAL OF DREDGED MATERIALS

3.12.1 Regulatory Context

Dredging and dredged material reuse/disposal is regulated by a number of agencies. The regulatory framework that governs dredged materials reuse/disposal include:

Federal Clean Water Act (FCWA). Section 404 of the FCWA authorizes the Army Corps of Engineers (ACOE) to issue permits regulating the discharge of dredged or fill material into the Waters of the U.S., including wetlands. Caltrans will obtain a Section 404 permit from the ACOE prior to project construction.

Rivers and Harbors Act. Section 9 of the Rivers and Harbors Act of 1899 is another federal regulation that applies to the East Span Project. Section 9 prohibits the construction of any bridge, dam, dike, or causeway over or in Navigable Waterways of the U.S. without Congressional approval. Administration of Section 9 has been delegated to the U.S. Coast Guard (USCG). Caltrans will obtain a Section 9 permit (Bridge Permit) from the USCG prior to the project construction.

In a letter to the ACOE dated August 26, 1999 (see Appendix G), the USCG stated that it would use its Section 9 permit to authorize dredging related to the construction of new piers and footings and removal of existing piers. Dredging for the barge access channels would be authorized by the ACOE under Section 10 of the Rivers and Harbors Act. This section regulates dredging or disposal of dredged material, excavation, filling, or other modification of a navigable water of the United States.

Marine Protection, Research, and Sanctuaries Act. The Marine Protection, Research, and Sanctuaries Act (MPRSA) regulates the ocean dumping of waste, provides for a research program on ocean dumping, and provides for the designation and regulation of marine sanctuaries. Section 102 of MPRSA authorizes EPA to issue ocean dumping permits for the transport and disposal of materials into the oceans. To protect critical ocean areas, EPA may designate the sites and time periods during which ocean disposal can occur.

Coastal Zone Management. There are three coastal zone management agencies in California: the California Coastal Commission, the San Francisco Bay Conservation and Development Commission (BCDC), and the Coastal Conservancy. BCDC has jurisdiction over San Francisco Bay. Under the Coastal Zone Management Act, BCDC issues federal consistency determinations for projects within its jurisdiction. Together, the McAteer-Petris Act, the San Francisco Bay Plan, the Seaport Plan, Special Area Plans, and BCDC's regulations comprise BCDC's Federally approved Coastal Zone Management Program. The East Span Project is within BCDC's jurisdiction. Project compliance with BCDC's federally approved Coastal Zone Management Program is addressed through BCDC's permitting process. Caltrans will obtain a permit and a federal consistency determination from BCDC prior to project construction.

The McAteer-Petris Act created BCDC in response to haphazard and uncoordinated filling of the San Francisco Bay. The primary purpose of the act is to promote responsible planning and development of San Francisco Bay. The act emphasizes the

elimination of unnecessary fill in the Bay, the use of the Bay for water-oriented purposes, and the provision of maximum feasible public access consistent with a proposed project. The act requires that a project have permits to fill, to extract materials, and to make substantial changes in use of land, water, or existing structures in the Bay. BCDC prepared the San Francisco Bay Plan (1969) which established policies to guide development in and along the Bay through a permitting process (see Section 3.1.3 — Adopted Goals and Policies).

Long-Term Management Strategy (LTMS) and Dredged Material Management Office (DMMO). In 1990, a consensus-based approach, the "Long-Term Management Strategy" (LTMS), was initiated by a group of federal, state, and local agencies to address and resolve the issue of dredging and dredged material disposal in the Bay Area. The signatories to the LTMS are the California State Lands Commission, San Francisco Bay Conservation and Development Commission, San Francisco Bay Regional Water Quality Control Board, U.S. Army Corps of Engineers, and U.S. Environmental Protection Agency.

In 1995, the LTMS program signatories established the Dredged Material Management Office (DMMO). The multi-agency DMMO seeks to foster a comprehensive and consolidated approach to handling dredged material management issues. While not a signatory, the California Department of Fish and Game also provides advice and expertise to the DMMO.

The DMMO program is reviewed every six months and is charged with fostering a comprehensive and consolidated approach to the processing of dredging reuse/disposal permit applications.

An LTMS Policy Environmental Impact Statement/Programmatic Environmental Impact Report (1998) developed policy recommendations and strategies for the placement of dredged material in the Bay region. The LTMS has three objectives:

- To distribute the dredged material between upland/wetland reuse sites, the ocean, and in-Bay in a manner that minimizes environmental impacts and maximizes environmental benefits in an economically sound manner;
- To identify guidelines for use during project planning to avoid or reduce potential harm while conducting necessary dredging and disposal activities; and
- To develop policies to improve regulatory certainty across all disposal options.

Each of those objectives translates, respectively, into the following LTMS proposed actions:

- Dredged material placement distributions;
- Comprehensive analysis of environmental impacts and risks (including cumulative impacts) and mitigation of potential adverse environmental effects; and

- A management system that successfully improves regulatory certainty.

The DMMO also reviews sediment sampling plans and results of sediment testing to assess the suitability of placing the sediment at various reuse/disposal sites.

One of the DMMO's goals is to evaluate whether dredged materials are suitable for unconfined aquatic disposal (SUAD) or not suitable for unconfined aquatic disposal (NUAD).

Although the DMMO issues a recommendation regarding dredged material reuse/disposal based on sediment testing results, the individual agencies that comprise the DMMO must still issue specific regulatory approvals for projects.

3.12.2 Sediment Sampling and Analysis

Caltrans has conducted sampling and analysis of sediments that would be dredged at the locations of new columns for the Preferred Alternative (Replacement Alternative N-6) and at barge and construction access areas for the northern replacement alternatives for the East Span Project. A DMMO-approved Sampling and Analysis Plan (SAP) to characterize sediments was developed through the DMMO review and comment process. Caltrans understands that additional sediment characterization may be required by DMMO if an alternative other than Replacement Alternative N-6 is selected. Caltrans also understands that, for all replacement alternatives, the sediments in the barge access channel for dismantling the existing bridge would need to be characterized in the future.

Results of Sediment Testing

The sediment testing evaluated the physical, chemical, and biological make-up of potential dredged material. The sediments encountered during the investigation were primarily silt and clay. Chemical analyses indicated that although some metals were detected in site sediments at levels exceeding San Francisco Estuary ambient concentrations, the majority of organic and inorganic analyte concentrations in site sediments were similar to concentrations detected in baseline sediments. Elevated levels of total polynuclear aromatic hydrocarbons (PAHs) (5,840 micrograms per liter [µg/L]) were detected at some column locations near Yerba Buena Island (YBI).

Liquid/suspended phase bioassays using sea urchins (*Strongylocentrotus purpuratus/Lytechinus pictus),* shrimp *(Mysidopsis bahia),* and fish *(Citharichthys stigmaeus)* were performed to evaluate the effect of site sediments on water column organisms in comparison with applicable baseline sediments. The results do not preclude any site sediments from disposal in the Bay or ocean or reuse at upland wetland reuse sites.

Solid phase bioassays using amphipods (*Ampelisca abdita*) and worms (*Nephtys caecoides*) were performed to evaluate the effect of site sediments on benthic organisms in comparison with applicable baseline sediments. The results of solid phase bioassays indicate that sediments from several locations near the Oakland

Touchdown are not suitable for disposal in the Bay or ocean and reuse at upland wetland reuse sites. These sediments would be properly disposed of at various commercial landfills.

Bioaccumulation testing was performed using clams (*Macoma nasuta)* and worms (*Nephtys caecoides)* to evaluate site sediment with deep ocean baseline sediment. PAH bioaccumulation was observed in sediments from near YBI and near the Oakland Touchdown, precluding sediments from these areas from disposal at the deep ocean site. Bioaccumulation observed at all other sites was not considered sufficient to restrict disposal of these site sediments at disposal sites in the Bay, ocean, or beneficial reuse at upland wetland sites.

In its letter of October 31, 2000 (see Appendix G for a copy of the letter), the DMMO made the following conclusions regarding the disposal of dredged materials:

1) Up to 248,219 cubic meters (324,681 cubic yards) of site sediments are suitable for unconfined aquatic disposal (in-Bay and deep ocean) and;

2) Up to 319,181 cubic meters (417,503 cubic yards) of site sediments are suitable for beneficial reuse at upland wetland sites.

As discussed above, any sediment not suitable for the above sites would be properly disposed of at a landfill.

See Section 4.14.10 — Construction Excavation and Dredging for a discussion of project dredging quantities.

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

4.1 COMMUNITY IMPACTS

The East Span Seismic Safety Project (East Span Project) does not lie within the boundaries of any established residential neighborhood. Land within the project area is under institutional, residential, and commercial use. Project alternatives were analyzed for potential impacts to local communities, including impacts on employment; community services; potential for displacement of residences, businesses, or public facilities; and consistency with existing land uses and development policies.

4.1.1 Social and Economic Impacts

Project alternatives were analyzed for potential social and economic impacts. Socioeconomic impacts are considered to occur if a project:

- Induces substantial growth in a community or prohibits desirable growth;
- Places demands on community facilities;
- Disrupts existing patterns of interaction in a neighborhood; and
- Affects a low-income or minority community.

The East Span Project is not expected to have adverse social or economic impacts on established neighborhoods or communities because of the project's location in an institutional and industrial setting with limited residential use and because the alternatives do not change existing transportation capacity. Any project-related changes to social or economic conditions in Bay Area neighborhoods or communities are expected to result from the employment impacts of the large construction labor force that would be needed to construct the build alternatives.

Employment

Project build alternatives would generate demand for workers during the construction period. Construction would have a positive impact by generating direct construction jobs and spin-off service employment opportunities within the region. Workers are expected to be recruited from the local labor force, with specialty skills being provided by workers from inside and outside the region.

The Bay Area has a large labor force and strong economy; thus, it is expected that the vast majority of the construction labor force would be workers already living in the area. However, some specific work, such as bridge iron work, can only be done by a limited number of national contractors, resulting in a need to import specialist workers. In a worst-case scenario, in which there are many major construction projects occurring concurrently (compared to the base level), a shortfall of construction workers could develop in the region.

If a shortage developed, other workers would commute from outside the region (Central Valley) or take up temporary residence. Temporary construction workers often rent rooms stay in motels, or seek other types of temporary housing during the work week, leaving their families behind. In addition to motels and rooms, there are more than 700,000 rental units within the Bay Area. Although there is a low vacancy rate in the Bay Area, the potential impact of the project labor force would not be noticeable on the housing market. The Bay Area is a large and dynamic region. At any given time, some companies and agencies are reducing their labor force while others are increasing. There is a movement of workers and households in and out of the Bay Area at all times, and the demand generated by East Span construction activities would not cause an adverse impact on the general availability of labor supply, the housing market, or school enrollment.

Construction materials, such as steel and concrete, are not produced in the project vicinity and are likely to be purchased from other areas. Thus, the local primary economic benefits of the project would be the direct construction jobs and the economic multiplier caused by local spending of the construction labor force. The Association of Bay Area Governments (ABAG) estimates that the number of local secondary jobs created is 1.44:1 construction job. Because the region has a large design and engineering labor force, this effect is likely to occur locally as well, providing additional labor jobs.

No-Build Alternative. The No-Build Alternative would not generate additional employment opportunities because no construction work beyond the prior Interim Retrofit Project would be undertaken.

Retrofit Existing Structure Alternative. Engineering design and construction of the Retrofit Existing Structure Alternative are expected to generate approximately 2,356 total person years of employment not otherwise predicted for the Bay Area economy (see Table 4.1-1). A forecast of construction workers required to retrofit the existing East Span, by trade, assumes 60 iron workers, 60 pile drivers, 100 operating engineers, 60 carpenters, 40 concrete finishers, 40 laborers and miscellaneous workers.

Table 4.1-1 Potential Project Construction Employment Impacts of Build Alternatives

Alternative	Construction Cost ($000)	Construction Person Yrs.[a]	Engineering Design Cost ($000)	Design Person Yrs. [b]	Total Person Years
Retrofit Existing	$818,000	1,636	$90,000	720	2,356
N-2[c]	$1,476,000	2,952	$160,000	1,280	4,232
N-6 (Preferred) [c]	$1,485,000	2,970	$165,000	1,320	4,290
S-4[c]	$1,475,000	2,952	$160,000	1,280	4,232

Sources: Caltrans, September 1998.
Assumptions: [a] 19% of construction cost = labor @ $95,000/person year (includes overhead).
[b] 100% of design & engineering = labor @ $125,000/person year.
[c] High range of cost estimate for this alternative is presented in Table 2.4-1.
Note: The cost information in this table represents the estimated cost of the various alternatives based on information available in 1998. They do represent the current costs of the alternatives, which would be greater, but still have the same relative relationship. See Section 2.4.2 — Costs for more information.

Replacement Alternatives

A forecast of construction workers required to construct a replacement bridge was estimated based on average annual employment of 600 people over the estimated seven-year construction period, which includes dismantling the existing bridge. (The number of employees required would increase if the construction period is shortened.) Estimated direct labor by trade is: 102 iron workers, 100 pile drivers, 168 operating engineers, 100 carpenters, 65 concrete finishers, and 65 laborers and miscellaneous workers.[1] With a peak period of two years for structural work on a new bridge, a peak demand of approximately 175 iron workers would be required.

Replacement Alternatives N-2, N-6 (Preferred), and S-4 are each calculated to generate slightly more than 4,000 total person years of employment over the construction period (see Table 4.1-1).

Impacts of Build Alternatives. Build alternatives would generate direct and indirect labor demand during a period lasting up to seven years. Workers are expected to be drawn from the regional labor pool with specialty trades generating demand from outside the Bay Area. A portion of the specialty trades may be attracted to the Bay Area for the duration of the project. Because of the large Bay Area economy, consisting of approximately three million jobs, worker-generated demands for housing or community services are not expected to have a noticeable effect on San Francisco, Oakland, or other Bay Area community housing stocks or services. The project is expected to have a beneficial impact on San Francisco and Oakland economies by generating direct and indirect jobs. The community would benefit through direct and secondary employment opportunities and no mitigation is required.

Neighborhoods

San Francisco (Yerba Buena Island). Construction of the Retrofit Existing Structure Alternative and replacement alternatives all have the potential to cause temporary impacts to residents on Yerba Buena Island (YBI), including USCG housing and occupied former Navy housing. (See Section 4.14 — Temporary Impacts during Construction Activities for more details.) There would be no permanent impacts.

Oakland. A construction staging area could be built at the former Oakland Army Base (OARB). Construction activity would not affect neighborhoods in West Oakland. Because the project would be built within San Francisco Bay, there would be no impacts to community cohesiveness or other permanent impacts to West Oakland neighborhoods.

4.1.2 Community Services

No impacts to community services were identified under any of the categories: utilities, fire protection services, and police services. Permanent utility service would not be disrupted by the project (see Section 4.12 — Utilities Relocation for more details); police and fire protection services would not change as a result of the project, and access to the Treasure Island (TI) elementary school would not be affected by the project.

[1] Richard Parrino, Parsons Brinckerhoff, March 1998.

One of the columns of Replacement Alternative S-4 would be placed on the East Bay Municipal Utility District (EBMUD) pipeline that feeds into the dechlorination facility on the Oakland Touchdown. If Replacement Alternative S-4 is carried through to final design, the column could be moved to avoid the pipeline. However, even if the column is relocated under Replacement Alternative S-4, there would be insufficient vertical clearance between the bridge structure and the road used by large chemical supply tractor-trailer trucks to serve the dechlorination facility. To maintain EBMUD's access to its facility, the road, the facility, or both would need to be relocated (see Section 4.1.4 — Impacts to Existing Land Use for further details).

4.1.3 Environmental Justice

There are no identified minority or low-income populations or communities in the project area. (FHWA defines populations as "readily identifiable groups or clusters of minority persons and/or low-income persons who are in the project study area.")[2] Outside the project area limits on TI and in West Oakland there are communities which are comprised of minority and low-income populations.

Title VI Policy Statement
Appendix L contains Caltrans policy regarding compliance with Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, and Title 29 CFR Part 21.

No-Build Alternative
There would be no change in the existing environment in the neighborhoods outside of the project area limits.

Retrofit Existing Structure and Replacement Alternatives
Only minimal impacts are expected on the TI community. During construction of the project, temporary changes in access and bridge closures would affect mobility of the TI community. Caltrans is continuing to investigate the number and timing of partial or full bridge closures in an effort to simultaneously minimize public inconvenience, facilitate construction and maximize public safety. Short-term closures would be timed during off peak hours and Caltrans would implement a traffic management plan to manage impacts to traffic. Those who live or work on TI would be notified of any bridge closures or changes in access through signage and possibly direct mailings. Final notification procedures would be determined through the Traffic Management Plan.

Emergency access to TI/YBI would be provided at all times.

Communities in West Oakland are not expected to encounter any traffic or access problems or other adverse impacts from the project.

As indicated in Section 4.1.1 — Social and Economic Impacts, construction of any of the build alternatives could provide increased employment opportunities from which

[2] Federal Highway Administration, Western Resource Center – San Francisco, Interim Guidance Addressing Environmental Justice in the Environmental Assessment (EA)/Environmental Impact Statement (EIS), July 2, 2000.

both the TI and West Oakland neighborhoods could benefit. In addition, the benefits of the completed project including improved traffic operations and safety, would be provided to all adjacent neighborhoods.

It was determined that there are no minority or low-income populations in the project area that would be adversely affected by the East Span Project. Based on the environmental analysis in other sections of the FEIS, the Preferred Alternative or other build alternatives would not cause disproportionately high and adverse impacts (including any indirect impacts) on minority or low-income populations outside the project limits.

4.1.4 Impacts to Existing Land Use

This section describes changes in land use that would occur as a result of the project alternatives.

Changes in Land Use

Potential project-related changes to existing land uses on YBI and at the Oakland Touchdown are summarized in the following section. Permanent impacts are addressed here. Short-term construction-period impacts are addressed in Section 4.14 — Temporary Impacts During Construction Activities.

Land Use Impacts on Yerba Buena Island.

No-Build Alternative. Implementation of the No-Build Alternative would not cause a change in any existing land uses on YBI. No impacts would result and no mitigation would be required.

Retrofit Existing Structure Alternative. With the exception of temporary impacts during construction, the Retrofit Existing Structure Alternative would not cause any changes to existing land uses in the project area. The footprint of Columns YB1, YB2, YB3, YB4, and E1 would be expanded in size but would remain in their current locations. Because the towers and cross-members would be encased in concrete, current views through the towers would be blocked (refer to Figure 4-15a in Appendix A and see Section 4.3 — Visual Impact Analysis). No new columns would be constructed on the island. No permanent impacts would result from the retrofit alternative and no mitigation would be required.

Replacement Alternatives. The new bridge structure for each replacement alternative would begin east of the YBI tunnel portal. The areas of impact for each of the three alternatives overlap. Many of the same buildings on the eastern edge of the island would be affected by all of the alternatives.

Replacement Alternative N-2. Replacement Alternative N-2 is positioned to the north of the existing East Span. The alternative would place 26 bents between the YBI tunnel eastern portal and the eastern end of YBI. The alternative would also require construction of temporary detours to be used while the viaduct is retrofitted and transition structures on YBI are constructed. (Refer to Appendix A for alignment and

temporary detour drawings.) Impacts of the temporary detours are discussed in Section 4.14 — Temporary Impacts During Construction Activities.

An existing road providing access to the northeast end of the island would be blocked (see Section 4.2.1 — Vehicular Circulation and Access). The alternative would not remove existing structures or block access to existing uses on the island.

Replacement Alternative N-2 would cross approximately 53 meters (175 feet) above the ground at vacant Navy Building 262, but would not place columns at locations which would obstruct future access to the building. Navy Building 213 (fire truck storage) would be removed to allow for construction of the temporary detours (which would require placement of a column through the building.) The alternative would be approximately 10 meters (33 feet) closer horizontally to Quarters 1 than the existing East Span (i.e., approximately 40 meters [130 feet] south of Quarters 1). However, the proximity of the span would not affect access to this building or place the columns permanently within the boundaries of the Senior Officers' Quarters Historic District.

Replacement Alternative N-2 would displace Buildings 30 (storage), 40 (administration), 75 (storage), and 270 (vacant) to relocate the USCG access road and gate and Building 213 to allow for temporary detour construction. Construction of Replacement Alternative N-2 would require that the existing access road and gate to the USCG facility be moved south. Replacement Alternative N-2 has not been identified as the Preferred Alternative.

Mitigation:
If Replacement Alternative N-2 were constructed, Caltrans would work with the USCG and Navy to provide replacement buildings of like size, construction, construction materials, and quality, built to current code requirements for Buildings 30, 40, 75, 213, and 270. The USCG and Navy would need to provide suitable sites for the replacements outside state right-of-way.

Replacement Alternative N-6 (Preferred). Replacement Alternative N-6 is located to the north of the existing East Span in an alignment similar to Replacement Alternative N-2. The alternative would place approximately 19 bents between the eastern portal of the YBI tunnel and the eastern edge of YBI. The alternative would require construction of temporary detours to be used while the viaduct is retrofitted and transition structures on YBI are constructed. (Refer to Appendix A for alignment and temporary detour drawings.) Impacts of the temporary detours are discussed in Section 4.14 — Temporary Impacts During Construction Activities.

Replacement Alternative N-6 would cross approximately 53 meters (175 feet) above the ground at vacant Building 262, but would not place columns at locations which would obstruct future access to the building. Building 213 (fire truck storage) would be removed to allow for construction of the temporary detours. The alternative would be approximately 10 meters (33 feet) closer horizontally to Quarters 1 than the existing East Span, which is approximately 40 meters (130 feet) south of the building. However, the proximity of the span would not affect access to the building or place columns permanently within the boundaries of the Senior Officers' Quarters Historic District.

Replacement Alternative N-6 would displace Buildings 30, 40, 75, and 270 to relocate the USCG access road and gate and Building 213 to allow for temporary detour construction. Construction of Replacement Alternative N-6 would require that the existing access road and gate to the USCG facility be moved south.

Mitigation:
If Replacement Alternative N-6 were constructed, Caltrans would work with the USCG and Navy to provide buildings of like size, construction, construction materials, and quality, built to current code requirements for Buildings 30, 40, 75, 213, and 270. The USCG and Navy would need to provide suitable sites for the replacements outside state right-of-way.

Replacement Alternative S-4. Construction of Replacement Alternative S-4 across YBI would require 24 bents between the eastern portal of the YBI tunnel and the eastern shoreline of the island. Temporary detours would be required on YBI during construction.

Replacement Alternative S-4 would displace Buildings 30, 40, 75, and 270 to relocate the USCG access road. Replacement Alternative S-4 would be located approximately 50 meters (164 feet) from Quarters 1, which is 10 meters (33 feet) farther than the existing East Span, and 60 meters (190 feet) from Navy Building 262.

Mitigation:
If Replacement Alternative S-4 were constructed, Caltrans would work with the USCG to provide buildings of like size, construction, construction materials, and quality, built to current code requirements for Buildings 30, 40, 75, and 270. The USCG and Navy would need to provide suitable sites for the replacements outside state right-of-way.

Land Use Impacts at the Oakland Touchdown Area. Replacement Alternatives N-2 and N-6 touch down to the north of the existing East Span while Replacement Alternative S-4, the southern alternative, touches down south of the existing structure.

No-Build Alternative. Implementation of the No-Build Alternative would not cause a change in any existing land uses in the Oakland Touchdown area. No impacts would result and no mitigation would be required.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would not cause any changes to existing land uses in the Oakland Touchdown area. The bridge footprint would be modified only to increase the size of Column E23 at the western end of the touchdown area. No permanent impacts would result from the retrofit alternative and no mitigation would be required.

Replacement Alternatives.

Replacement Alternatives N-2 and N-6 (Preferred). Replacement Alternatives N-2 and N-6, located to the north of the existing span, would have a similar approach to the Oakland Touchdown area. The northern alternatives would require the permanent displacement of 0.2 hectare (0.5 acre) of land north of the existing bridge that the City of Oakland has designated as Resource Conservation Area.

Replacement Alternative S-4. As shown in Figures 2-11.4 and 2-11.5 in Appendix A, Replacement Alternative S-4 would occupy the westernmost portion of the vacant OARB land to the south of the existing East Span and open storage areas just north of the vacant OARB land used by Caltrans.

Replacement Alternative S-4 is currently designed to place a column in the pipeline east of the EBMUD dechlorination facility. While the column could be redesigned to avoid the pipeline, the vertical clearance between the structure and the service road is insufficient to allow for delivery vehicles to the dechlorination facility. Consequently, if Replacement Alternative S-4 were selected, there would be a conflict with the facility.

Several solutions were evaluated to possibly eliminate the conflict. They include:

- Relocating the existing access road far enough south to provide sufficient vertical clearance beneath the roadway. This would require placing additional fill in the Bay to build the roadway. The area of new fill would be approximately 0.36 hectare (0.9 acre) and the volume would be approximately 13,650 cubic meters (18,000 cubic yards);

- Lowering the grade of the existing service road to create a tunnel beneath Replacement Alternative S-4. The high water table at the Oakland Touchdown would make the tunnel susceptible to flooding and require a pump system to keep the service road open at all times. Caltrans would likely incur ongoing responsibilities for maintaining the tunnel roadway and facilities;

- Building an overpass structure over Replacement Alternative S-4. The overpass structure would add an additional roadway structure near the western end of the Oakland Touchdown area that would block Bay views for motorists, pedestrians, and bicyclists;

- Relocating the dechlorination facility to the north would require the relocation of at least a part of the onshore pipeline while keeping it operational at all times and preventing accidental discharge of effluent. This would still require the service road to be routed under or over Replacement Alternative S-4;

- Relocating the dechlorination facility to the south would require the relocation of part of the onshore pipeline while keeping it operational at all times and preventing accidental discharge of effluent. The relocation would also require additional fill in the Bay for support of the facility;

- Relocating the dechlorination facility to the west would require additional fill in the Bay to support it and would still require the service road to be routed under or over Replacement Alternative S-4; and

- Relocating the dechlorination facility to the east of Replacement Alternative S-4 would reduce the distance over which the effluent is treated. This would reduce the chlorine contact time. EBMUD's discharge operations would need to be modified to provide the same treatment to the effluent over a shorter distance to meet the requirements of EBMUD's permit from the Regional Water Quality Control Board limiting coliform in the effluent.

Mitigation:
If Replacement Alternative S-4 were constructed, Caltrans would work with EBMUD to relocate the service road and/or the dechlorination facility to maintain EBMUD's operations. Caltrans would obtain necessary permits/permit amendments, fund relocation costs, and implement any necessary mitigation. Caltrans would assure continual operation of EBMUD's discharge system during relocation.

4.1.5 Development Trends

The purpose of this section is to evaluate the relationship between the proposed project and anticipated development trends at YBI and the Oakland Touchdown area.

Yerba Buena Island/Treasure Island Draft Reuse Plan Consistency
The Treasure Island Draft Reuse Plan (1996 Draft Reuse Plan) includes "minimum" development scenarios, based upon the existing traffic capacity and access and a guiding policy for development of Naval Station Treasure Island, which states that development should be limited to uses for which access can be accommodated primarily by ferry.

Vehicular access is a major constraint to development on YBI/TI. The East Span Project would not increase the SFOBB's capacity nor would it improve the access points from the SFOBB to YBI/TI. The eastbound on-ramp to the SFOBB would be replaced with a ramp that provides a standard acceleration lane as opposed to the current stop-sign design, resulting in improved eastbound access to the bridge from YBI.

The 1996 Draft Reuse Plan envisions that development of YBI/TI would occur in five phases. Each phase would build on the previous phase in order to generate the revenue necessary to make needed infrastructure improvements. In turn, this infrastructure would allow for more intensive development in subsequent phases. The phased implementation process is projected to extend over a period of 35 years. Development on YBI is envisioned to occur within the first three phases of plan implementation, which are projected to occur over a 15-year period. To the extent the implementation plan was premised on release by the U.S. Navy and CCSF of a final NEPA/CEQA document several years ago, the phasing schedule appears to be approximately three years behind schedule, as the U.S. Navy and CCSF have not yet released the draft NEPA/CEQA document.

Planned development near the bridge on YBI includes a 5,600-square meter (60,000-square foot) conference center, 13 artisan cottages, and 75 live/work units. This development is in Phase 3 and is scheduled to begin in 2007. The three implementation phases affecting YBI are summarized below.

Phase 1

Phase 1 was anticipated to begin in 1997 and continue through 2001 as closure of the base occurred. In this phase, limited interim uses of the existing facilities are planned. On YBI, Phase 1 assumes that all of the existing buildings would continue in civilian uses, including provision of housing for the homeless and use of Quarters 1 through 7 as a conference/ meeting center. (Note: Housing for the homeless is now in process on TI. No housing for the homeless is planned for YBI.)

Phase 2

Phase 2 improvements are listed in the 1996 Draft Reuse Plan as scheduled to occur between 2002 and 2006. Phase 2 envisions the beginning of improvements to the TI shoreline, including causeway reinforcement between TI and YBI and creating a secure land link to the SFOBB and the proposed ferry terminal on TI. After infrastructure improvements are made, a theme park, sports complex, maritime administration, and expansion of the film studios on TI are proposed as part of Phase 2.

On YBI, Phase 2 includes redevelopment of the existing housing on the west side of the island for housing and hotel uses.

According to the 1996 Draft Reuse Plan, expansion of the Treasure Island Marina was originally scheduled for Phase 2 development. Since the plan was written, the marina project has been accelerated and is currently in the planning stage (see Figure 4-23 in Appendix A).

Construction of the Treasure Island Marina is scheduled to begin in mid to late 2001, after approval of the final plan, preparation and approval of the environmental document, and acquisition of permits.

Phase 3

Phase 3 improvements are listed in the 1996 Draft Reuse Plan as scheduled to occur between 2007 and 2011, which is after completion of the East Span Project (2006). Consequently, there would be no construction conflicts between the two projects. In Phase 3, improvements would be made to stabilize the eastern shoreline on TI, which would allow completion of the theme park. Development of a hotel/retail area is also envisioned in this phase.

On YBI, Phase 3 improvements would include development of the conference center and artisan cottages on the eastern end of the island.

The development potential of YBI would be affected but not precluded by the physical location of the project. Due to the steep topography of most of the island, the eastern end is considered by the CCSF to be the only viable location for development. Also, because the 1996 Draft Reuse Plan will be subject to a number of environmental and

regulatory reviews prior to its implementation (including a BCDC federal consistency determination and permit, discussed in Section 4.1.6 — Adopted Goals and Policies), the amount and location of new development on the eastern end of YBI may vary widely from the current development concepts. An analysis of the impacts on the development trends on YBI is described below.

No-Build Alternative. The No-Build Alternative would not conflict with the 1996 Draft Reuse Plan development scenarios, although vehicular access to and from the East Bay could be affected in the aftermath of a major earthquake.

Retrofit Existing Structure Alternative. Expansion of existing East Span columns on YBI would not conflict with redevelopment scenarios for YBI. Since the 1996 Draft Reuse Plan was developed with the bridge in its current location, the conceptual land uses proposed in the plan could be developed under the Retrofit Existing Structure Alternative.

The Retrofit Existing Structure Alternative is consistent with the 1996 Draft Reuse Plan in that it does not include modifications to YBI on- and off-ramps that would change the capacity of existing vehicular access. YBI ramps are not owned by Caltrans and are not critical to providing a lifeline connection in the project corridor. Therefore, the retrofit alternative would not conflict with the transportation access assumptions of the 1996 Draft Reuse Plan.

No long-term impacts would result from implementation of the Retrofit Existing Structure Alternative and no mitigation measures would be required. Temporary impacts during construction are addressed in Section 4.14 — Temporary Impacts During Construction Activities.

Replacement Alternatives N-2 and N-6 (Preferred). The northern alternatives would require placement of footings and columns across the eastern end of YBI. The conceptual development scenario contained in the 1996 Draft Reuse Plan (Figure 4-1 in Appendix A) could be implemented under either Replacement Alternative N-2 or N-6. The number of live/work units and the size of the conference center would be reduced, due to the presence of footings and columns for the northern replacement alternatives; however, the overall concepts could be implemented. Development could occur on 3.15 hectares (7.8 acres) of land, including 1.17 hectares (2.9 acres) beneath the structures, subject to review and approval by Caltrans.

The northern alternatives are consistent with the transportation element of the Reuse Plan because they would not modify YBI on- and off-ramps to change the capacity of existing vehicular access. The ramps are not owned by Caltrans and are not critical to providing a lifeline connection in the project corridor. One eastbound on-ramp is proposed for modification under the replacement alternatives, but would not change access capacity to the island. Therefore, Replacement Alternatives N-2 and N-6 would not conflict with the transportation access assumptions of the 1996 Draft Reuse Plan.

Construction-related impacts are discussed in Section 4.14 — Temporary Impacts During Construction Activities.

Caltrans has initiated consultation with the CCSF concerning the impacts of the northern alternatives on reuse plans. Caltrans will continue to coordinate with CCSF through the final design and construction periods.

Replacement Alternative S-4. Replacement Alternative S-4 would locate the replacement structure to the south of the existing East Span and remove the existing bridge. As a result, the project would open up some additional areas for YBI redevelopment. Approximately 0.8 hectare (2.0 acres) of land that is currently occupied by the existing span could become available for development. This would be a beneficial impact as it relates to CCSF's redevelopment of YBI. The area suitable for development would be 3.7 hectares (9.1 acres), including 0.6 hectare (1.4 acre) beneath the structures.

As with the northern alternatives, Replacement Alternative S-4 is consistent with the transportation element of the Reuse Plan.

USCG Property Impacts

The development potential of the USCG property would be impacted by the project build alternatives. In April 1998 as part of the BRAC process, the Navy transferred 4.3 hectares (10.6 acres) to the USCG. Of this land, 1.1 hectares (2.7 acres) is within the project area and approximately 0.41 hectares (1 acre) is developable (the remainder is constrained by steep slopes). No specific master plan has been developed for expansion of the existing USCG facility because the USCG has delayed final master plan preparation pending outcome of the TI BRAC process and final design for the East Span Project.

No-Build Alternative. The No-Build Alternative would not affect existing USCG facilities. The No-Build Alternative would not limit future redevelopment beyond the limitations currently imposed by the existing East Span.

Retrofit Existing Structure Alternative. Expansion of existing columns and footings would not conflict with existing USCG facilities or limit future redevelopment beyond the limitations currently imposed by the existing East Span. Temporary construction impacts are discussed in Section 4.14 — Temporary Impacts During Construction Activities.

Replacement Alternatives N-2 and N-6 (Preferred). The northern replacement alternatives would have no permanent impact on USCG usable land area.

Replacement Alternative S-4. Footings and support columns for Replacement Alternative S-4 would use the southeastern portion of YBI and span approximately 1.5 hectares (3.8 acres) of the 17-hectare (41-acre) USCG facility. USCG land under the bridge could be developed, subject to review and approval by Caltrans. Although the USCG does not have a master plan for the YBI facility, Replacement Alternative S-4 would restrict future facility development.

Oakland Touchdown Area

The Oakland Army Base Reuse Authority (OBRA) is in the process of designating land south of Burma Road for light industrial/research and development uses with supporting retail and business services. BCDC amended the San Francisco Bay Plan and the Seaport Plan in January 2001 to delete this area from the "Port Priority Use" designation to permit implementation of OBRA's plan.

The 1998 Draft Final Reuse Plan for the Oakland Army Base designates 5.9 hectares (14.7 acres) of the westernmost portion of the former Army Base on the Oakland Touchdown as the site of a proposed public park. The OBRA is considering reducing the amount of land to 4.9 hectares (12 acres), but has yet to release a revised Reuse Plan. The proposed Gateway Park is a Section 4(f) resource.

The Port and City of Oakland are participants in a planning effort to establish the Gateway Park at the Oakland Touchdown area. (See discussion of Public Parks and Open Space below.) The Port has stated its intention to work with the Oakland Gateway Planning Group to develop design concepts which accommodate the East Span Project, Port activities, public access, and open space in the Oakland Touchdown area.

No-Build Alternative. The No-Build Alternative would not conflict with OBRA's redevelopment plans.

Retrofit Existing Structure. The Retrofit Existing Structure Alternative would not require the use of the former OARB property and would not conflict with OBRA's redevelopment concepts.

Replacement Alternatives N-2 and N-6 (Preferred). The northern alternatives would not use the former OARB property and would not conflict with OBRA's redevelopment concepts.

Replacement Alternative S-4. Replacement Alternative S-4 would conflict with the proposed public park discussed below but would not conflict with OBRA's other redevelopment concepts.

Oakland Touchdown Area — Public Parks and Urban Open Space

With EBRPD as the lead, planning has been initiated with the City of Oakland, the Port of Oakland, EBRPD, ABAG/Bay Trail, OBRA, National Park Service (NPS), and BCDC to create a Gateway Park at the Oakland Touchdown. Decisions about the replacement alternatives are critical to the park planning process.

No-Build Alternative. The No-Build Alternative would not impact EBRPD development of OBRA-designated parkland on the southern border of the Oakland Touchdown area; therefore, no impact to parkland development would occur and no mitigation would be required.

Retrofit Existing Structure. The Retrofit Existing Structure Alternative would not impact EBRPD development of parkland on the southern border of the Oakland

Touchdown area; therefore, no impact to development of parkland would occur and no mitigation would be required.

Replacement Alternatives N-2 and N-6 (Preferred). The northern alternatives would not impact EBRPD development of parkland on the southern border of the Oakland Touchdown area; therefore, no impact to development of parkland would occur and no mitigation would be required.

Replacement Alternative S-4. Replacement Alternative S-4 would negatively affect the Gateway Park development at the Oakland Touchdown. This alternative would require approximately 3 hectares (7.4 acres) of the proposed 5.9-hectare (14.7-acre) park for construction of the bridge, thereby reducing its size by one-half and bisecting the land designated for park use by OBRA. The park's reduced size and location would limit its intended function as a regionally significant recreational area and as a gateway to the East Bay. To minimize the impact to the proposed Gateway Park, the land required for Replacement Alternative S-4 could be replaced by acquiring land nearby to contribute toward another smaller park in the area. For further information on the park, see Chapter 6 — Section 4(f) Evaluation.

Impacts to Required Bay Access Sites

As part of the I-880/Cypress Freeway Replacement Project, Caltrans is required by BCDC to provide and maintain a public access bicycle/pedestrian pathway system connecting the Cities of Emeryville and Oakland between Shellmound Street and Nelson Mandela Parkway, through the distribution structure for I-80 to the Oakland Touchdown area. Caltrans is also required to provide two scenic overlooks, a 465-square-meter (5,000-square-foot) outlook on the north side of the Oakland Touchdown area and a 232-square-meter (2,500-square-foot) lookout area on the south side of the Touchdown area. Both overlooks include public amenities such as parking, restrooms, benches, a fish cleaning facility, trash cans, and native landscaping. Caltrans submitted a request to BCDC to amend Permit 11-93 to delay implementation of the access areas until completion of East Span construction. On July 31, 1998, BCDC amended Permit 11-93 to extend the period for construction of the public access areas to December 31, 2006. The permit includes an in-lieu-fee provision that allows Caltrans to pay a sum equal to the costs of the required amenities should construction of some or all of the public access prove infeasible. Payment of the in-lieu fee is subject to BCDC approval. BCDC may disburse the funds to the EBRPD to improve public access where feasible. Each replacement alternative would require ongoing consultation with BCDC to determine the optimum locations of these public access overlooks.

No-Build Alternative. The No-Build Alternative would not interfere with implementation of the public access improvements required under BCDC Permit 11-93. No impact would occur and no mitigation would be required.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would not conflict with provision of the public access improvements required under BCDC Permit 11-93.

Replacement Alternatives N-2, N-6 (Preferred), and S-4. Each of the proposed replacement alternatives would have an impact on the public access required under BCDC Permit 11-93. The northern alternatives would preclude construction of the public access overlook required by the BCDC for the northern side of the Oakland Touchdown. Replacement Alternative S-4 would preclude the development of the public access overlook on the south side of the Oakland Touchdown area, bicycle path, access roadway, and parking area required by BCDC Permit 11-93.

Caltrans will consult and coordinate with BCDC to determine necessary public access modifications and/or permit requirements under Permit 11-93. Modifications to the public access requirements could be identified as conditions in a future amendment to Permit 11-93 and/or incorporated into a new permit for a bridge replacement alternative.

4.1.6 Adopted Goals and Policies

The purpose of this section is to evaluate the relationship between the proposed project and existing land use, transportation, and coastal policies which will guide future development in the western and eastern touchdown areas.

Land Use Policies

Treasure Island Draft Reuse Plan (The City and County of San Francisco). The replacement of the East Span would have no impact on CCSF's program to implement the guiding policies of the 1996 Draft Reuse Plan nor on the CCSF's program to implement the goals and policies of the CCSF's Master Plan. The 1996 Draft Reuse Plan and the CCSF's Master Plan both assume that the East Span will continue to provide an essential link for auto traffic between YBI and the East Bay.

As discussed in Section 4.1.5, Replacement Alternatives N-2 and N-6 are generally compatible with the 1996 Draft Reuse Plan. The 1996 Draft Reuse Plan has not been formally adopted, and it would be subject to environmental and regulatory review, which could alter what is currently envisioned for eastern YBI in the draft plan. The DEIR/DEIS for the reuse plan has not been issued yet.

The goals and policies of the 1996 Draft Reuse Plan also identify the existing bridge and ramps as one of the continuing institutional uses on YBI, as the bridge provides an essential link for auto traffic between YBI and the East Bay. Planned uses on the western side of YBI and on Treasure Island would not be affected by the East Span Project.

City of Oakland (Envision Oakland). The East Span Project is consistent with Oakland's policies for future development and land uses within the project area. With the exception of one conflict (discussed in Section 4.1.4 — Impacts to Existing Land Use), replacement of the SFOBB East Span would have no impact on the City's program to implement the goals and policies of the General Plan. Construction of either Replacement Alternative N-2 or N-6 would conflict with the Resource

Conservation Area land use designation, which applies to all of the land on the Oakland Touchdown area, north of the existing alignment. The northern alternatives would displace 0.2 hectare (0.5 acre) of the Resource Conservation Area. The City of Oakland has been an active participant in the planning efforts to establish the Gateway Park. As mentioned previously, Replacement Alternative S-4 would negatively impact Gateway Park development. In the City's comments on the DEIS, Acting Planning Director Leslie Gould noted, "Of the proposal alignments, the City prefers Replacement Alternative N-6 because it would have the fewest impacts on planned land uses."

The SFOBB is an integral part of the existing system that supports Oakland's vision of the City's "primacy as a transportation hub connecting the Bay Area with the Pacific Rim and the rest of the United States (Envision Oakland General Plan)."

The Oakland Touchdown area is located immediately adjacent to the City's seaport area (i.e., Port of Oakland facilities). The seaport area is classified as a showcase district in the City's General Plan. Showcase districts are dynamic areas that can respond to broad trends and market demands. The policy framework of the plan supports these districts in their continued growth and regional importance. The SFOBB provides an important link between the City's showcase districts, San Francisco, and the San Francisco Peninsula.

Oakland Policies T4.5, T4.9, and *T6.3* support preparation of a Bicycle and Pedestrian Master Plan, the creation of a "gateway" public access area at the east terminus of the East Span, and making the waterfront accessible to bicyclists and pedestrians. The East Span Project includes cooperation by Caltrans with planning efforts to create public access areas in the Oakland Touchdown area that will support implementation of these City policies. These characteristics of the SFOBB project also support the Waterfront Goals of the General Plan, relative to promoting public access to the waterfront.

The "New Bay Bridge," as the SFOBB East Span Project is described in Regional Access: Policies in Action, Chapter 3 of the City's General Plan, provides opportunities for increased bicycle, pedestrian, and transit access to the bridge. Additionally, the General Plan recommends that new parks and open space at the Oakland Touchdown should be integral components of the project. The replacement alternatives include features, such as the bicycle and pedestrian facilities which are consistent with the City's policies. All replacement alternatives would accommodate public access through BCDC Permit 11-93 and park development by EBRPD, but Replacement Alternatives N-2 and N-6 substantially more so than Replacement Alternative S-4 because Replacement Alternative S-4 would reduce the size of the proposed park by approximately one-half while Replacement Alternatives N-2 and N-6 would have no impact on the development of the proposed park.

Since the Retrofit Existing Structure Alternative does not provide improved bicycle or pedestrian access, it is not consistent with this Oakland General Plan policy.

Port of Oakland. The SFOBB East Span Project is consistent with the Port and City of Oakland's plans for an office and commercial development along the shoreline of the

Oakland Touchdown area east of the envisioned park. This activity would not be precluded by any of the proposed build alternatives.

U.S. Coast Guard (USCG). The USCG does not currently have a master plan in place for the YBI facility. In general, the USCG plans to maintain its current level of operations at the YBI facility, including 24-hour search and rescue, repair and maintenance of buoys, vessel traffic service, and law enforcement. Replacement Alternatives N-2 and N-6 would not substantially affect current level of operations. Replacement Alternative S-4 would encroach over the USCG facility and would restrict the USCG's ability to utilize its portion of YBI. The replacement bridge would span approximately 1.5 hectares (3.8 acres) of the 17 hectares (41 acres) of USCG property.

East Bay Regional Park District (EBRPD). As noted in earlier sections, the OBRA's 1998 Reuse Plan designates 5.9 hectares (14.7 acres) at the westernmost end of the former OARB property for a Public Benefit Conveyance to the EBRPD for a future park. Construction of Replacement Alternatives N-2 and N-6 and the Retrofit Existing Structure Alternative are consistent with the OBRA Reuse Plan and EBRPD's intention to develop a park after the East Span Project is constructed. Replacement Alternative S-4 would negatively impact the Gateway Park development by taking 3 hectares (7.4 acres) of the proposed park area. (Refer to Chapter 6 — Final Section 4(f) Evaluation for additional information on the proposed Gateway Park and the project alternatives.

Transportation Policies

City of Oakland - Envision Oakland. Oakland's transportation policy includes the following:

Objective T4. *Increase use of alternative modes of transportation.*

Policy T4.8 - Accommodating Multiple Types of Travel on the Bay Bridge. The City should encourage the design and engineering for the new Bay Bridge to accommodate multiple means of access and travel by automobiles, trucks, transit, bicycles, pedestrians, and future mass transit.

Each of the East Span Project replacement alternatives would accommodate multi-modal travel on the bridge. High-occupancy vehicle (HOV) bypass ramps would remain in operation at both the west and east bridge approaches to encourage carpools, vanpools, and bus transit use. Provision for future mass transit would be accommodated by continuation of Alameda-Contra Costa Transit District (AC Transit) bus service and by design of the replacement structures to accommodate loading for future light rail transit vehicles. Replacement alternative designs also include a bicycle/pedestrian path. The proposed project is consistent with this policy.

Policy T4.8 - "Gateway" Public Access Area. The City, in concert with the EBRPD, Port of Oakland, Oakland Base Reuse Authority, and BCDC, should support development of a significant new "gateway" public park area at the terminus of the SFOBB East Span that can be reached by auto, bicycle, or walking.

The East Span Project includes coordination with the agencies concerned with future uses of land in the Oakland Touchdown area. Collaborative planning efforts involving the City of Oakland, Port of Oakland, EBRPD, BCDC, NPS, and the Army are in progress.

City and County of San Francisco Master Plan. The CCSF's transportation policy includes the following:

Objective 1.

Policy 1. Involve citizens in planning and developing transportation facilities and services, and in further defining objectives and policies as they relate to district plans and specific projects.

The East Span Project is consistent with this policy as it has provided many opportunities for public involvement in the process. (See Appendix E for a summary of public involvement activities.)

Objective 4.

Policy 2. Where significant transit service is provided by buses, bridges and freeways should have exclusive bus lanes.

Efficient bus operations as part of the East Span Project alternatives are facilitated by provision of bus/carpool (HOV) bypass lanes at the west and east bridge approaches. Provision of exclusive bus lanes has been considered as part of the East Span Project. It was determined that dedicated facilities would not provide any benefits. (See Section 2.5.)

Objective 5.

Policy 3. The existing vehicular capacity of the bridges, highways and freeways should not be increased and should be reduced where possible.

The East Span Project is consistent with this policy as it does not increase capacity.

Objective 8.

Policy 4. Accommodate bicycles on regional transit facilities and important regional transportation links.

The East Span Project replacement alternatives include designs for a bicycle/pedestrian path. The replacement alternatives are consistent with this policy.

Association of Bay Area Governments - The Bay Trail. ABAG's plans for trails include the following:

Transportation Access Policies.

30. *Bridges and roads will be important connections in the Bay Trail system, providing not only commute routes, but enhancing the recreational use of the Trail by creating trail loops which will allow a greater number of people to enjoy the Trail.*

31. *In the short term, attention should be focused on improving safe access to the bridges, possible expansion of bicycle shuttle services, and public transit accommodations of bicycles to allow crossbay access.*

32. *In the long term, unconstrained access on bridge structures is preferred. This can more easily be accomplished in planning future facilities, as long as public access is a requirement for new structures. Legislative action which would require bicycle and pedestrian access on new facilities should be actively sought.*

33. *Opportunities for cooperative funding of pedestrian and bicycle accessways should be investigated in order to make financing feasible.*

The East Span Project would be consistent with these policies because the replacement alternatives would provide the first link of a transbay crossing by providing a path to YBI. (The feasibility of a West Span path is under review by the MTC and Caltrans.) A path on the East Span would be an important connection to Bay Trails on both sides of the Bay. The East Span Project would improve access to the bridge and would enhance the safety of the bridge itself. The bicycle/pedestrian path is to be funded as outlined in Section 188 of the California Streets and Highways Code (CSHC).

San Francisco Bay Plan (Bay Conservation and Development Commission) Policies.

Land Use. BCDC requires that every project provide the maximum feasible public access to the Bay consistent with the project. In planning meetings for the conceptual Gateway Park at the Oakland Touchdown area, BCDC concurred that it would consider combining the requirements for public access specified in Permit 11-93 with any additional public access requirements for the East Span Project. (Note: Section 60604.5 of the Streets and Highways Code states, "Notwithstanding any other provision of law, local and state permitting authorities shall not impose any requirement that a bicycle, pedestrian, or mass transit facility be constructed on the San Francisco-Oakland Bay Bridge as a condition for issuing any permit, granting any easement, or granting any other form of approval needed, for the construction of a new bridge." As a result of this law, BCDC cannot require a bicycle or pedestrian facility on the bridge as a permit condition.)

The East Span Project would be consistent with BCDC's public access policy as Caltrans would provide bicycle, pedestrian, and vehicular access to the Oakland

Touchdown area as part of both the East Span Project and BCDC's previous conditions of approval for the I-880 and I-80 projects (see the Permit 11-93 discussion in Section 3.1.3 — Adopted Goals and Policies for further details). Public access to the Bay is required as part of the I-880 and I-80 projects. If the public access improvements, including the overlooks and bikeway alignments prove infeasible due to replacement of the bridge, the permit conditions allow Caltrans to pay an in-lieu fee to construct the improvements subject to BCDC approval. BCDC may disburse the funds to the EBRPD or another entity to improve public access where feasible.

The proposed project is consistent with the BCDC's policies for future development as contained in the San Francisco Bay Plan and the Seaport Plan; the replacement of the East Span would have no impact on the BCDC's program to promote its policies guiding land use and development around the Bay. The Bay Plan strongly encourages that new transportation facilities be designed to encourage use of mass transit. The proposed project is consistent with this policy, as the proposed alternatives would maintain the HOV bypass lanes at the toll plaza and west approach that presently take buses and carpools around congestion points. The Bay Plan also strongly encourages development and use of public parks. The configuration of overlooks required as part of the I-880 and I-80 projects would be affected by the East Span Project. Given the intent of EBRPD and other parties to provide a much larger area for public access and amenities south of the bridge, public access requirements for parks and overlooks are expected to be fulfilled with any replacement alternative, though with a lesser quality park configuration under Replacement Alternative S-4. EBRPD plans for the Gateway Park are independent of the East Span Project.

Transportation. The BCDC Bay Plan includes the following:

Policy 4. *If a route must be located across a waterway, the following provisions should apply:*

a. The crossing should be placed on a bridge or in a tunnel, not on solid fill.

b. Structures should provide adequate clearance for commercial ships, Navy ships, and pleasure boats to have uninterrupted passage at all times.

c. Toll plazas, service yards, or other ancillary features should not be located on new fill.

d. To provide maximum ultimate capacity on any new route that is allowed over or under a waterway (and thus to minimize the number that might have to be allowed in the Bay), the design of the route should, if feasible, accommodate future mass transit facilities and subsequent installation of automatic power and guidance elements for vehicles.

The East Span Project is consistent with BCDC policy "a". All alternatives propose a bridge crossing. Concerning policy "b", the height of all alternatives under consideration has been set in consultation with the USCG to provide adequate navigational clearance. Project alternatives would not require new fill for ancillary

facilities. The project alternatives are, therefore, consistent with policy "c". Although the project does not propose a new route over the Bay, project alternatives are consistent with policy "d" in that consideration is being given to accommodation of structural loading requirements for future light rail transit.

Dredging and Fill. Bay Plan Dredging Policy 2 establishes a preferential hierarchy for disposing of dredged material. This hierarchy is intended to minimize impacts to the Bay from dredge disposal activities. The policy states that dredged material should be disposed of by:

- Placement as fill in approved locations;
- Ocean disposal;
- Dry land disposal; and
- In-Bay disposal at designated locations.

Dredging required for the project would result from construction activities (see Section 4.14.10 — Construction Excavation and Dredging). Caltrans has initiated consultation with BCDC and other regulatory agencies through the Dredged Material Management Office (DMMO) concerning disposal of dredged materials (see correspondence in Appendix G). Dredged material would be disposed of at locations approved by the DMMO and subject to BCDC review for policy consistency.

Section 66605 of the McAteer-Petris Act (discussed in Section 3.1 — Community Setting) and the Bay Plan regulate Bay fill, requiring that fill be minimized and permitted only if it meets certain conditions. Under Section 66605, bridges are considered to be water-oriented uses for which fill can be placed in the Bay. (Refer to Section 4.9.1 — Placement of Fill in the San Francisco Bay for a discussion of Bay fill quantities.) Permanent Bay fill associated with the build alternatives include bridge piles, pile caps, piers, and decks, and engineered fill for the westbound roadway and Caltrans' maintenance road at the Oakland Touchdown area. Temporary Bay fill associated with the build alternatives include trestles, falsework, cofferdams, barge mooring facilities, and other construction facilities.

Visual. Bay Plan policies related to the appearance and design of bridge structures and the visual prominence of bridge towers are advisory only. Policies relating to maximizing views to the Bay from bridges are enforceable. The Retrofit Existing Structure Alternative is generally consistent with these policies because it would not change existing railing heights or add substantial new superstructure that would decrease motorists' views. Modifications to the substructure including addition of two bridge columns and expansion of existing columns would not change the basic visual form of the existing structure.

The replacement alternatives are consistent with the Bay Plan's visual policies. Bay Plan policies concerning views to and from the bridge and tower type and design were incorporated into design recommendations developed by the Metropolitan Transportation Commission's (MTC's) Bay Bridge Design Task Force (Task Force) and the Engineering and Design Advisory Panel (see Appendix E).

Construction of the build alternatives (including the Retrofit Existing Structure Alternative) would require a permit from BCDC pursuant to the McAteer-Petris Act and a concurrence from BCDC that the project is consistent with the Commission's federally approved Coastal Zone Management Program (CZMP). Both the required development permit and the concurrence must establish that construction of the replacement alternatives is consistent with the McAteer-Petris Act, the San Francisco Bay Plan (including the "Park Priority Use" designation at YBI), and the Seaport Plan.

Caltrans has initiated consultation with BCDC concerning consistency of the East Span Project with the Commission's CZMP. In a letter dated February 4, 2000, BCDC provided a preliminary concurrence for the East Span Project. (Refer to Appendix G: Agency Consultation Letters.)

After the Record of Decision has been approved, the FEIS and detailed engineering will be provided to BCDC during final project design for its use in the federal consistency concurrence and Bay Plan permit process.

4.2 TRANSPORTATION

Each of the proposed alternatives would retain five eastbound and five westbound traffic lanes on the East Span. Replacement alternatives would require roadway modifications on YBI and the Oakland Touchdown area (as summarized below), but none of the alternatives would create long-term impacts to local traffic, transit, and maritime traffic. Construction-related impacts are discussed in Section 4.14 — Temporary Impacts During Construction Activities.

4.2.1 Vehicular Circulation and Access

For each alternative, changes in vehicular traffic circulation, operations, and access are identified and design considerations are described that would be incorporated into the alternatives.

SFOBB Traffic Operations

Traffic operations under the No-Build Alternative and the Retrofit Existing Structure Alternative would remain the same as under existing conditions. Each of the East Span replacement alternatives may improve traffic operations on the SFOBB: the addition of 3-meter (10-foot) shoulders on both sides of the roadway would provide refuge for disabled vehicles. This may reduce non-recurrent congestion caused by minor accidents or stalls that block one or more lanes of traffic. However, the extent of non-recurrent congestion caused by major incidents is unlikely to be affected by the addition of shoulders. The addition of shoulders would also reduce the number of lane closures for maintenance.

During traffic incidents, all of the proposed replacement alternatives for the East Span Project may experience traffic operational impacts in the opposite travel direction from the incident as a result of rubbernecking. When an incident occurs on a typical freeway segment, secondary congestion frequently occurs in the opposite direction of travel as a result of drivers slowing to view the incident. When an incident occurs on either the upper or lower deck of the existing SFOBB, there is currently no impact to traffic headed in the opposite direction because drivers are unable to see opposing traffic or incidents. The proposed replacement structures would place eastbound and westbound traffic at the same level and 15 meters (50 feet) apart, creating opportunities for drivers to see incidents on the opposite structure, which may cause delays in the non-incident travel direction.

Yerba Buena Island

There would be no long-term impacts to traffic circulation, access, or transit operations on YBI from the No-Build Alternative, Retrofit Existing Structure Alternative, or the replacement alternatives. The replacement alternatives would, however, create long-term changes in the alignment of certain YBI roadways as described below. These roadway modifications would be required for each replacement alternative. No loss of access would result under the replacement alternatives. Neither the No-Build nor the Retrofit Existing Structure Alternative would require long-term roadway modifications.

Required roadway modifications as a result of the Preferred Alternative are described in detail in Section 2.6.2 — Bridge Replacement Alternatives and summarized below:

- Macalla Road would be lowered approximately 1 meter (3 feet) and realigned to avoid bridge columns and connect with a modified Southgate Road. All existing access to Macalla Road would be maintained;

- Southgate Road would be realigned both horizontally (13 meters [43 feet] east) and vertically (up to 3 meters [10 feet]). All existing access would be maintained;

- The USCG Road would be realigned 20 meters (66 feet) south to avoid the columns of the new bridge. Construction would include a new gate and guard shack for the USCG facility; and

- A portion of the access road leading to Building 262 would be permanently realigned approximately 15 meters (49 feet) to the south. The realigned portion would become a two-lane roadway that would conform to the existing single-lane dirt road approximately 115 meters (377 feet) from the eastern end of YBI.

The vertical and horizontal changes to the roadways would be slightly different for each replacement alternative, depending on the bridge alignment.

Oakland Touchdown Area

No-Build Alternative, Retrofit Existing Structure Alternative, Replacement Alternatives N-2 and N-6 (Preferred). The No-Build Alternative, Retrofit Existing Structure Alternative, and Replacement Alternatives N-2 and N-6 would have no long-term impacts to traffic circulation, access, or transit. Under the northern replacement alternatives, the existing Caltrans maintenance road would be realigned, but there would be no loss of access.

Replacement Alternative S-4. Replacement Alternative S-4 would not affect existing transit service in the Oakland Touchdown area, but would require modification of existing access patterns.

Under Replacement Alternative S-4, the existing Caltrans maintenance road would need to be realigned (see Figures 2-11.4 and 2-11.5 in Appendix A). The southern shoreline east of Replacement Alternative S-4 would continue to be accessed by Burma Road, which would be truncated at existing Terminal Seven. The portion of Burma Road that would be eliminated would not affect traffic circulation or access to any buildings in the area. No loss of access would occur to Caltrans maintenance buildings because access would be configured to the south using the realigned maintenance road. The vertical clearance between the new bridge approach structure and the EBMUD service road would be insufficient to allow large delivery truck access to the EBMUD dechlorination facility. Relocation of the service road, the facility, or both would be required (see Section 4.1.4 — Impacts to Existing Land Use for further discussion).

Local access roadway reconfigurations would be part of the construction of Replacement Alternative S-4. Realigned access roadways would serve existing facilities and any future park development, with the exception of the dechlorination facility. Relocation of the dechlorination facility is discussed in Section 4.1.4 — Impacts to Existing Land Use. No other impacts due to change in access would result; therefore, no mitigation is proposed.

4.2.2 Non-Motorized Traffic: Bicycles and Pedestrians

Pedestrian and non-motorized traffic are currently prohibited on the existing East Span and no dedicated, signed bicycle/pedestrian paths currently exist within the project area. Project alternatives have been assessed for the potential to accommodate planned and proposed pathway connections, and the replacement alternatives each incorporate a bicycle/pedestrian path.

Citizen participation in planning for the bicycle/pedestrian path on the East Span has been facilitated by the MTC and Caltrans through the Bay Bridge Bicycle/Pedestrian Advisory Committee (BPAC).

Yerba Buena Island

Project alternatives have no permanent impacts to bicycle and pedestrian circulation on YBI. The 1996 Draft Reuse Plan proposes bicycle and pedestrian modes as the primary modes of transportation on YBI. There are currently no signed bicycle paths or lanes on YBI and the Navy and the CCSF have no plan in place for the creation of bicycle/pedestrian facilities on the island. Bicycle and pedestrian use of public street rights-of-way on YBI would be possible under any East Span Project alternative. The bicycle/pedestrian path proposed for the Preferred Alternative (Replacement Alternative N-6) and Replacement Alternatives N-2 and S-4 would terminate on the eastern side of YBI. In the final design phase for a replacement alternative, Caltrans would work with the Navy and/or the CCSF to design appropriate path connections to the local roadway network. Caltrans would consult with the Navy and/or other property owners on YBI about their interest in having directional signage installed for path users on the bridge. If consultation results in agreement on the nature and placement of the signs, Caltrans would install the signage. To the extent the Navy and CCSF believe the SFOBB bicycle/pedestrian path would create excessive demand on Navy/CCSF facilities on YBI, Caltrans would limit access to YBI at the request of the Navy and/or the CCSF. Should the Navy or the CCSF desire YBI access to be specifically directed, limited, or prohibited, Caltrans would work with these agencies to design signage or barriers. Caltrans does not have responsibility or authority for areas of YBI and TI once path users leave the path on the East Span.

Caltrans and MTC are currently preparing a feasibility study for a possible bicycle/pedestrian/maintenance path from San Francisco across the West Span and a connection around YBI to a path on the replacement East Span. The preliminary design in this study locates the potential West Span path at the upper deck level outward of the existing stiffening trusses on both sides of the West Span. The pathway would descend into San Francisco on elevated structures west of the current San Francisco anchorage and terminate near the intersection of Harrison and Fremont

Streets. East of the YBI anchorage, the path would continue on elevated structures which would connect to an at-grade path along the south side of YBI, generally along the existing Treasure Island Road, that would then connect to the East Span path. Any future pathway on the West Span and on YBI would be a separate project. The East Span path could accommodate connections to a possible path on the West Span.

Oakland Touchdown Area

No-Build and Retrofit Existing Structure Alternatives. The No-Build and Retrofit Existing Structure Alternatives would have no impacts to bicycle and pedestrian circulation in the Oakland Touchdown area.

Replacement Alternatives. The replacement alternatives, including the Preferred Alternative (Replacement Alternative N-6), would create no negative impacts to bicycle and pedestrian circulation in the Oakland Touchdown area. Access to and from the replacement alternatives would be from the south side of the eastbound structure. Each of the replacement alternatives would provide bicycle/pedestrian access to the bridge and would provide sufficient vertical clearance where necessary to permit a bicycle and rider to travel under bridge structures. The Bay Trail would connect with the East Span structure from West Oakland along a bikeway adjacent to I-80 to be provided by Caltrans under the requirements of BCDC Permit 11-93. This Oakland-to-Emeryville segment of the Bay Trail will be funded by Caltrans as part of the I/880 Cypress Freeway Replacement Project. Implementation of this Bay Trail segment will be coordinated with the East Span Project and Gateway Park plans.

East Span Bicycle/Pedestrian Access

Proposed alternatives have been evaluated for their potential to provide bicycle and pedestrian access to and on the East Span. Criteria used to assess project impacts are:

- Ability to incorporate a bicycle and pedestrian path on the East Span;
- Suitability of profile grades; and
- Connectivity to bicycle and pedestrian access at either the Oakland Touchdown area or YBI.

No-Build and the Retrofit Existing Structure Alternatives.

Path Accommodation and Placement. The No-Build and the Retrofit Existing Structure Alternatives do not incorporate a new bicycle and pedestrian path. The existing cross section of the bridge has five 3.5-meter (11.7-foot) travel lanes with no roadway shoulders, limiting the ability to restripe the bridge deck to accommodate a path on the bridge. It may be possible to add a bicycle/pedestrian path to the existing bridge in the future under the No-Build or Retrofit Existing Structure Alternatives; however, MTC has provided funding only for a path on a replacement alternative.

Replacement Alternatives N-2, N-6 (Preferred), and S-4.
Path Accommodation. A bicycle and pedestrian path has been incorporated into each replacement alternative (see Figure 2-8 in Appendix A). A path would be constructed on the south side of the eastbound structure for each replacement alternative. The path would be 4.7 meters (15.5 feet) wide and 0.3 meter (1 foot) higher than the adjacent travel lanes and would include viewing areas, referred to as belvederes. The five belvederes on the skyway would be approximately 12 meters (39 feet) long by 1.2 meters (4 feet) deep. Caltrans is still investigating whether to include one or two belvederes on the main span; they would be 20 meters (66 feet) long by 1.2 meters (4 feet) deep. This configuration was developed with input from the BPAC and was approved by the MTC. Provision of bicycle/pedestrian access on the East Span would be a beneficial impact.

Consistency with Local Plans and Policies
Each of the East Span replacement alternatives, including the Preferred Alternative, would provide a bicycle and pedestrian path between YBI and the Oakland Touchdown area. Provision of the path would be consistent with the following local plans:

- City and County of San Francisco, Naval Station Treasure Island Draft Reuse Plan;
- San Francisco Bay Conservation and Development Commission, Bay Plan;
- City of Oakland, Pedestrian and Bicycle Master Plan; and
- Association of Bay Area Governments, Bay Trail Plan.

Impacts to SFOBB Bicycle Shuttle Service
All East Span Project alternatives could accommodate the existing Caltrans bicycle shuttle service.

4.2.3 Parking

For each alternative, changes in long-term parking supply resulting from project alternatives have been identified. It should be noted that Caltrans' temporary construction easement (TCE) includes the majority of the Parade Grounds, where YBI parking is available. A small portion of the Parade Grounds is owned by Caltrans. The TCE shall terminate when Caltrans determines that it no longer is required , at which time the property will revert to the federal government.

Yerba Buena Island
No-Build Alternative. The No-Build Alternative would not modify the number of parking spaces on YBI.

Retrofit Existing Structure. Strengthening of existing Column YB3 under the Retrofit Existing Structure Alternative would eliminate approximately four informal parking spaces in the paved area east of Quarters 1. Given the large undeveloped area available for parking, the loss of four parking spaces at the eastern end of this area would not contribute to unmet parking demand and would not create an impact. No mitigation would be necessary for this minor change in parking supply.

Replacement Alternatives. Each of the East Span Replacement Alternatives, including the Preferred Alternative, would eliminate between 6 and 8 informal parking spaces in the paved area east of Quarters 1. Given the large undeveloped area available for parking, the loss of this small number of parking spaces would not contribute to unmet parking demand and would not create an impact. No mitigation would be necessary for this minor change in parking supply.

Oakland Touchdown Area

There would be no long-term loss of parking spaces under any of the project alternatives. The project would add day-use parking as part of public access. There would be a new parking lot near the entrance to the bicycle/pedestrian path on the bridge. The parking lot would be temporary to avoid conflicts with plans for the Gateway Park and could eventually be incorporated into the park design. The size of the lot is undetermined at this time, but would, at a minimum, satisfy the parking requirements of BCDC Permit 11-93 for six parking spaces.

4.2.4 Marine Traffic

The potential for ship collisions with the East Span alternatives has been evaluated. Impacts to the structures from vessel types likely to use the waters under the bridge are presented below.

Methodology

Information regarding type, size, and frequency of vessels that use the shipping channel east of YBI was collected to determine vessels likely to pass under the East Span in open water. The largest vessels currently using the main navigation opening are fuel barges traveling to and from the oil refinery at Point Richmond.

American Association of State Highway and Transportation Officials (AASHTO) specifications[3] were used to estimate impact loads on towers and columns. Head-on and side-impact collisions were considered. To evaluate worst-case impacts, it was assumed that cruise ships could use the east channel under potential development scenarios for TI. The vessel's speed, mass, and crushing of its hull were considered in developing impact loads. Cruise ships, being larger than existing barges using the eastern navigation channel, would generate the largest impact loads.

No-Build Alternative

The No-Build Alternative would not modify the existing East Span and would not change navigation patterns through the main navigation opening. No modifications to the bridge are proposed under this alternative; therefore, no modifications would be constructed to minimize impacts of future ship collisions. Should a collision occur, existing fenders would protect the existing bridge. Existing deteriorated fenders are being repaired, and these fender systems would also be repaired as required following vessel collisions.

[3] AASHTO Guide Specifications and Commentary for Vessel Collision Design of Highway Bridges, Volume I: Final Report, February 1991, American Association of State Highway and Transportation Officials, Washington, D.C.

Retrofit Existing Structure Alternative

The Retrofit Existing Structure Alternative would strengthen existing columns in the main navigation opening, shorten spans, increase the ability of the structure to withstand impact from a maximum-design cruise ship at the main span columns and impacts of barges at the shorter span columns. More columns would increase the likelihood of a collision between a vessel and a column. The additional columns would also narrow the existing main navigation opening. The alternative would maintain a width of at least 147 meters (481 feet) between columns in the main navigation opening, and a vertical clearance of 42 meters (138 feet) over mean high water. The resulting channel width, while slightly less than the 152 meters (500 feet) recommended by the USCG,[4] would be adequate for navigation. Following construction of Columns E2A and E2B in the existing main navigation opening, column protection, such as fenders, would be needed at least in the three new main navigation openings. The USCG is evaluating whether or not column protection would be needed in other navigation openings. Column protection would be provided where identified as necessary by the USCG.

Replacement Alternatives N-2, N-6 (Preferred), and S-4

As part of the bridge design, protective fenders are proposed at the main tower and skyway columns to provide sufficient standoff to prevent vessels from hitting columns and reduce pile cap damage on impact. The fenders could be either pile-supported or pile cap-mounted. One possible fender system would have a timber-rubbing face and remain elastic up to a particular level of impact energy. Beyond this level, it absorbs energy by damage to the concrete and timber, but is designed to be easily repaired. The system also provides a wearing surface on the column for minor collisions and bumps from merchant and recreational vessels.

All skyway foundations would be able to withstand the impact of a light drifting barge, and skyway columns would be able to withstand the maximum-design barge impact. The main towers and skyway column foundations would be capable of sustaining impacts for the maximum-design cruise ship.

No potential for significant damage to replacement structures has been identified, due to design of columns and fender systems, and no mitigation is required.

Each of the replacement alternatives would narrow the existing main navigation opening approximately 57 meters (187 feet). The replacement alternatives would have a navigation opening width of 348 meters (1,142 feet) and a vertical clearance of 43 meters (140 feet) over mean high water, and the resulting horizontal and vertical clearance would conform to USCG recommendations. The project would install all applicable navigation aids, such as fenders and lights.

[4] U.S. Coast Guard. Facsimile transmittal from Wayne Till (USCG) to Tony Wong (Caltrans). March 6, 1997.

4.2.5 Air Traffic

The No-Build and Retrofit Existing Structure Alternatives would not change the location or height of towers and would not require changes to obstruction markings or lighting to alert aircraft to the presence of the existing East Span.

The replacement alternatives, including the Preferred Alternative, would change existing obstruction markings and lighting. Federal Aviation Administration (FAA) Form 7460-1, "Notice of Proposed Construction or Alteration," would be filed with the FAA. The form would disclose the location and height of a cable-supported tower. The main span tower of the replacement alternatives would be higher than 150 meters (500 feet) above mean sea level and would require warning lights. Warning lights are required because the tower would exceed 61 meters (200 feet), which is FAA's maximum height for which warning lights are not required.

4.3 VISUAL IMPACT ANALYSIS

The purpose of the visual impact analysis is to evaluate the large-scale visual impacts of the project on the Bay Area.

The focus of the visual impact assessment is on the visual impacts of the Retrofit Existing Structure Alternative and design variations of the replacement alternatives (skyway and main span) and alignments of replacement alternatives (Replacement Alternatives N-2, N-6, and S-4) in terms of visual obstruction, dominance within the viewshed, and design quality in terms of vividness, intactness, and unity. These issues are also considered with respect to the types of viewers that would be affected by the project (residents, office workers, motorists, pedestrians, bicyclists, and recreational users).

The visual simulation figures (4-4 through 4-17c) in Appendix A include the Retrofit Existing Structure Alternative and Replacement Alternatives N-6 and S-4. Replacement Alternatives N-6 and S-4 were chosen because they demonstrate most clearly the differences between a northern and southern alignment. Replacement Alternative N-2 was not used in the photo simulations because it is located between the two other alternatives and would not enhance the representation of differences between a northern and southern alignment.

The following sections describe the visual impacts of the various project alternatives on each of the landscape units which make up the project area (Section 4.3.1), as well as the changes in visual quality that would be experienced from the 20 representative viewpoints around the Bay Area (Section 4.3.2). The changes in visual quality for motorists traveling on the East Span are also discussed (Section 4.3.3). Impacts and mitigation for tree removal and slope disturbance are summarized in Section 4.3.4.

Various bridge types other than cable-stayed, self-anchored suspension (preferred design variation), and skyway designs are not discussed in this section. An earlier process was established to evaluate the merits of these other bridge design types. The process began with meetings of the MTC Bay Bridge Design Task Force. The Task Force initiated an open request for ideas about the design of the main span of the East Span and held numerous public meetings. The Task Force also received an evaluation of various designs by a distinguished panel of engineering and architectural experts (the Engineering and Design Advisory Panel) and elected officials. (See Appendix E — Consultation and Coordination for more details.)

4.3.1 Visual Impacts Resulting in Changes Within Landscape Units

Landscape units are geographically distinct portions of the study area which have a particular visual character. The change to each of the five landscape units described in Section 3.3.2 — Existing Landscape Units and Visual Image Types was assessed for each of the four build alternatives and a number of design variations. The impact on landscape units and visual image types is evaluated for the period when the bridge is in full operation. Each landscape unit would be affected differently according to the combination of these alternative/design variations.

Yerba Buena Island

Retrofit Existing Structure Alternative. The retrofit alternative would not require alteration of visual features on the island. Operations would be identical to what exists today. All visual image types within this landscape unit would remain intact. Adding substantial structural members on the outside of the cantilever superstructure would add clutter and mass to existing bridge.

Skyway/Main Span Design Variations. Following construction and dismantling of the existing bridge, the YBI landscape unit would appear altered by the removal of portions of woodlands to the north and south of the span. The removal of vegetation would be a substantial alteration of this landscape unit and, depending on the size and species of the replacement planting, would require approximately 10 to 20 years to reestablish itself to its current density. It is probable, depending on the amount of clearing required, that residential structures currently obscured by the vegetation would become visible. Mitigation is discussed in Section 4.3.4 — Impacts Due to the Removal of Vegetation and Slope Disturbance.

The slope to the south of the East Span is extremely steep and, though the steepness of the slope would restrict the amount of construction activity which could take place on it, some access would be necessary to construct temporary and permanent columns on and near the slope. The appearance of this part of the slope may be permanently altered after construction, since the extreme angle of the slope and the characteristics of the underlying geology may not permit the slope to be returned to its original grade.

In addition, the footprint of the bridge itself would be altered because the single-deck roadway design would be more than three times the width of the existing span and require approximately 25-30 columns which would affect views to and from the island.

Replacement Alternative S-4 would reduce the size of the USCG facilities, although the structures that could be removed are not currently visible from the existing span. Similarly, Replacement Alternatives N-6 (Preferred) and N-2 would reduce the image type represented by removing Buildings 30, 40, 75, and 270. These structures are not currently visible from the existing span.

Main Span

Retrofit Existing Structure Alternative. Following the seismic strengthening measures, the landscape unit would reflect a slight increase in view blockage as a result of the introduction of two new columns, encasing other columns, and the installation of cross pieces. This would not be considered a substantial visual impact. The Bay would remain the predominant visual image type within this landscape unit.

Skyway Design Variation. Following the construction and dismantling period, this landscape unit would appear much different. The bridge deck would exhibit a much thinner profile than the existing structure because the cantilever element would not be present. In addition, the bridge would be a single-deck rather than a double-deck roadway. The steel cross beams that extend from the upper to lower deck on the existing structure would no longer be present. The skyway design variation profile

would consist of a simple concrete sidewall along either side of the deck, reading like a ribbon from points north and south. The predominant visual image type within this landscape unit would be the Bay.

Main Span Bridge Design Variation. Following the construction and dismantling period, the landscape unit would be dominated by a much taller and different tower element. The contrast between the existing cantilever and truss elements and the proposed single-tower element would be dramatic. The bridge would also be modified through the removal of the double-deck roadway. The single-deck side-by-side roadway would produce a much thinner profile, and the image of the bridge would be sleeker and lighter, because there would no longer be steel beams connecting the upper and lower decks. The predominant visual image type would remain the Bay.

Incline Section

Retrofit Existing Structure Alternative. The retrofit alternative would produce the least amount of change from the existing span. The span would continue to have two bridge decks connected by steel beams. The predominant visual image type of the incline section would remain the Bay. No change in the SFOBB's alignment would occur, and the bridge would appear visually much as it does today.

Skyway/Main Span Bridge Design Variations. Both the skyway and main span design variations would provide a skyway deck along this portion of the span. The greatest change to this landscape unit involves the replacement of the existing double-deck structure with side-by-side single decks. This change would cause the bridge to be more than double in width, while the height of the deck area would be reduced as a result of the reduced height of the bridge rail and the absence of the upper deck.

Replacement Alternative S-4 would offer the greatest change in viewshed as it follows a more southerly alignment, while Replacement Alternatives N-6 (Preferred) and N-2 remain closer to the SFOBB's existing alignment along this section of the bridge.

Oakland Touchdown

Retrofit Existing Structure Alternative. The retrofit alternative would produce the least amount of change from the existing span. The visual image types currently present at the touchdown area would not be altered with the implementation of the retrofit alternative. The alignment of the East Span would not change and additional right of way would not be required for its construction. The predominant visual image types would remain marsh and estuary areas and light industrial.

Skyway/Main Span Bridge Design Variations. Replacement Alternatives N-6 (Preferred) and N-2 would require construction within a portion of the area to the north of the existing span designated for resource conservation by the City of Oakland. Replacement Alternative S-4 would require construction within undeveloped and light industrial land to the south of the existing span. The result of this change in the SFOBB's existing alignment would be a reduction in the visual image types (marsh, estuary, and light industrial) associated with the land taken by the replacement alternatives. Replacement Alternatives N-2 and N-6 (Preferred) may involve adding fill

along the north side of the Oakland Touchdown to support bridge approach structures. Addition of fill would change the appearance of this portion of the touchdown.

The bridge itself would produce a much narrower profile and would be a lighter, more streamlined structure. The steel cross beams that currently extend between decks would not be present, and the single decks would be placed side by side rather than stacked one on top of another. The structure would be similar to what exists today as the bridge at this point is rejoining the SFOBB's existing alignment as it approaches the toll plaza.

SFOBB Toll Plaza

The toll plaza area would not undergo substantial change as a result of the project. The proposed replacement alternatives, including the Preferred Alternative, would rejoin the existing roadway at the toll plaza. The location of the toll booths would not change, and the realignment of the roadway to the north or south would not substantially affect the existing visual appearance of this landscape unit.

4.3.2 Impacts on Views from the Bridge

The following section describes the visual changes that motorists traveling on the SFOBB East Span would experience under the retrofit and replacement alternatives. To aid in this evaluation, an animation of the motorists' views was created for the replacement alternative's main span bridge design variations. Still pictures of key views from this animation are presented in Figures 4-2 to 4-3b in Appendix A. The complete set of animation is provided on a CD-ROM included in the Visual Impact Assessment Report which can be reviewed at locations identified in the Preface and on the worldwide web at www.dot.ca.gov/dist4.

Retrofit Existing Structure Alternative

The retrofit alternative would only slightly change motorists' views from the existing East Span. The current double-deck structure would be maintained, including its solid steel sidewalls that block some motorists' views of the Bay. Steel crossbeams that extend from the upper to the lower deck would be modified to permit large displacements at specified joints. As a result, views would continue to be restricted, especially in the eastbound direction where the presence of the westbound deck overhead results in a further obstruction to the viewshed. Adding substantial structural members on the outside of the cantilever superstructure would add clutter and mass to the existing bridge.

Skyway Design Variation

The skyway design variation would result in substantial changes to the motorists' view, because it would create side-by-side roadway decks with concrete side barriers and railings designed to facilitate views from the structure unlike the existing structure that has steel cross beams that extend from the upper to the lower structure. Because the skyway design variation would not include a main span tower, views would remain unobstructed throughout the length of the East Span.

With Replacement Alternatives N-6 (Preferred) and S-4, views toward the skyline of San Francisco would be expanded for westbound travelers, while Replacement Alternative N-2 would produce views similar to the existing span. Eastbound travelers would experience expansive views toward the Port of Oakland and toward the hills above the communities of Oakland, Berkeley, and Alameda, although visibility to the south may be compromised by the presence of a 4.7-meter (15.5-foot) wide bicycle/pedestrian lane and railings.

Although views from the East Span with the skyway design variation would be greatly expanded, three design issues would have an impact upon the extent of views from the structure. First, the roadways would be placed side by side. The impact of side-by-side roadways would be that viewers would have a five-lane roadway in the foreground of their view to the north (when traveling in the eastbound direction) or south (when traveling in the westbound direction). Second, the addition of a 3-meter (10-foot) shoulder on each side of the roadway further expands the structure in the motorists' foreground view. Finally, the creation of a 4.7-meter (15.5-foot) wide bicycle/pedestrian path on the south side of the eastbound bridge deck would affect views southward from the East Span. The bicycle and pedestrian lane would be raised 0.3 meter (1 foot) above the flow of auto traffic, further restricting views to the south.

When comparing replacement alternatives, Replacement Alternatives N-6 (Preferred) and S-4 would expand westbound views toward San Francisco by allowing views around YBI, because of their northerly and southerly locations, respectively, in comparison with the existing East Span. Replacement Alternative N-2 would expand views to a lesser degree because it closely follows the alignment of the existing East Span.

Main Span Design Variations

The main span design variations would also expand views from the East Span because, as with the skyway design variation, the East Span would be constructed with side-by-side roadways, concrete side barriers, and railings designed to facilitate views from the structure. The main span tower and cables would somewhat obstruct views as vehicles pass through the main span section. However, overall views would increase greatly when compared with the existing structure. In addition, views of the towers and cables while driving on the incline would increase the vividness of the view from the incline.

As with the skyway design variation, Replacement Alternative N-6 (Preferred) and Replacement Alternative S-4 would produce expanded views toward the skyline of San Francisco for westbound travelers, while Replacement Alternative N-2 would produce an effect similar to the existing span. Eastbound travelers would experience expansive views toward the Port of Oakland and toward the hills above the communities of Oakland, Berkeley, and Alameda, although views to the south may be compromised by the presence of a 4.7-meter (15.5-foot) wide bicycle/pedestrian lane and railings.

The design issues noted above for the skyway design variation would have a similar impact on views from the main span tower. The creation of side-by-side single decks, the addition of 3-meter (10-foot) shoulders, and the construction of a 4.7-meter (15.5-

foot) bicycle/pedestrian path would restrict views from the East Span to the north and south. Figures 4-2, 4-3a, and 4-3b in Appendix A depict a motorist's view while driving on the main span variation.

When comparing replacement alternatives, Replacement Alternatives N-6 (Preferred) and S-4 would expand westbound views toward the city of San Francisco by allowing views around YBI, because of their northerly and southerly locations, respectively, in comparison with the existing East Span. Replacement Alternative N-2 would expand views to a lesser degree, because it would closely follow the alignment of the existing East Span.

4.3.3 Impacts on Views to the Bridge

The changes in visual quality due to the project alternatives have been analyzed from 20 viewpoints around the Bay Area, as described in Section 3.3.3 — Viewer Groups and Viewpoints. Generally, the changes that would occur with each of the various project alternatives and design variations would be similar from each of the viewpoints. The analysis from five viewpoints has been included in the FEIS to represent the changes in visual quality from each location. These viewpoints are Richmond (from the north), the Oakland Touchdown area (from the east), the Oakland-San Francisco Ferry (from the south), TI (from the west), and the Nimitz House on YBI. This analysis included computer-generated visual simulations.

Impact of Build Alternatives

The retrofit alternative would have a negligible impact on visual quality from distant viewpoints, because the structural elements added to the East Span would not be perceptible. For some of the closer viewpoints, the retrofit alternative would have a minimally adverse impact on viewers, as the additional structural elements (new columns and strengthening of existing columns) would obstruct views underneath the bridge.

The main span design variations (self-anchored suspension [preferred design variation] and cable-stayed) would result in the most favorable impact upon visual quality regardless of the viewpoint location. Typically, this is due to the increase in the vividness of the span. Also, overall unity would occur with the self-anchored suspension main span. While conditions would vary at individual viewpoints, overall the three replacement alternatives (N-2, N-6 [Preferred], and S-4) would result in virtually identical visual impacts.

The skyway design variation would result in the greatest reduction in visual quality. Typically, this impact would be due to a reduction in the vividness and intactness of the span caused by the simpler structure and thinner bridge deck. While conditions would vary at individual viewpoints, overall the alignments of the three replacement alternatives under the skyway design variation would result in virtually identical visual impacts.

Analysis from Representative Viewpoints

Richmond Marina.

Retrofit Existing Structure Alternative. The retrofit alternative would have a negligible impact on visual quality. The long distance from this viewpoint to the East Span would make changes to the columns and support structures imperceptible.

Skyway Design Variation. The skyway design variation would have a minimally adverse impact on visual quality, due to its reduction in vividness (see Figure 4-4 in Appendix A). While it would remain at a favorable viewing angle, the simplicity of the structure would eliminate the striking and distinctive nature of the existing East Span.

Main Span Design Variations. The self-anchored suspension (preferred design variation) and cable-stayed design variations would have a minimally beneficial impact on the visual quality of the view towards the East Span. The main span tower would add landmark strength and distinctiveness, but the distance between the viewpoint and the East Span would make its distinct elements difficult to discern.

The self-anchored suspension (preferred design variation) and cable-stayed design variations would have a beneficial impact on the overall visual quality from the Richmond Marina, due to the increase in the vividness of the East Span and overall unity of the view (see Figure 4-5 in Appendix A). Unity would increase the greatest amount (from moderate-to-high to high) for the self-anchored suspension main span, due to the visual similarity, prominence, and shape compared with the SFOBB West Span (which is visible from the vantage point). Unity would increase less (remaining at moderate-to-high) with the cable-stayed main span, because its shape would not echo the cable forms of the SFOBB West Span.

Oakland Touchdown Area.

Retrofit Existing Structure Alternative. The retrofit alternative would result in a minimally adverse impact on visual quality of the view toward the East Span, due to the increase in view obstruction. New support columns and other structural elements added as part of the retrofit alternative would decrease views beneath the East Span.

Skyway Design Variation. The skyway design variation would result in a minimally adverse impact on visual quality, due to the slight decrease in the vividness of the East Span (although the East Span's close proximity and prominence mean vividness would still remain high) (see Figure 4-6 in Appendix A). In addition, with Replacement Alternatives N-2 and N-6 (Preferred), there would be a slight increase in view obstruction. These alternatives would provide views similar to the existing East Span, although its more gradual rise from east to west would obstruct views from beneath the East Span to the north.

Main Span Design Variations. The self-anchored suspension (preferred design variation) and cable-stayed design variations would result in a minimally beneficial impact on visual quality of the view toward the East Span, due to the increase in vividness and unity and the fact that the East Span occupies much of the larger view

(see Figure 4-7 in Appendix A). The main span tower would add landmark strength and distinctiveness. Vividness would increase the most with Replacement Alternatives N-6 (Preferred) and S-4, because the main span tower would be at a more favorable viewing angle (closer to 45 degrees) than Replacement Alternative N-2.

Unity would increase most with Replacement Alternatives N-2 and N-6 (Preferred), though the overall impact is slightly lessened by the high visibility, from this viewpoint, of approximately 30 support columns on YBI. Compared to Replacement Alternatives N-2 and N-6, Replacement Alternative S-4 would produce less of an increase in unity because portions of the SFOBB West Span would be visually obstructed. With all replacement alternatives, unity would increase more with the self-anchored suspension main span, due to the visual similarity, prominence, and shape compared with the SFOBB West Span and Golden Gate Bridge (which are visible from the vantage point). Unity would increase less with the cable-stayed main span, because its shape does not echo the cable forms of the SFOBB West Span.

Oakland-San Francisco Ferry.

Retrofit Existing Structure Alternative. The retrofit alternative would result in a negligible impact on visual quality. New support columns and other structural elements added as part of the retrofit alternative would decrease views beneath the East Span. However, views beneath the East Span would be constantly changing as the ferry travels across the Bay, thereby minimizing the view obstruction created by the new columns and structural elements.

Skyway Design Variation. The skyway design variation would result in a minimally adverse impact on visual quality, due to the decrease in its vividness (see Figure 4-8 in Appendix A). While it would remain at a favorable viewing angle and would be relatively close, the simplicity of the skyway design variation would reduce the distinctive nature of the existing East Span. The reduction in the vividness would be less perceptible with Replacement Alternative S-4, because it is the closest replacement alternative to this viewpoint. Vividness would reduce the most with Replacement Alternative N-6 (Preferred).

Main Span Design Variations. The self-anchored suspension (preferred design variation) and cable-stayed design variations would result in a minimally beneficial impact on the visual quality of the view toward the East Span, due to the increase in its vividness (see Figure 4-9 in Appendix A). The main span would add landmark strength and distinctiveness to the East Span. When comparing replacement alternatives, vividness would be most increased with Replacement Alternative S-4, because it is nearest to this viewpoint.

The self-anchored suspension (preferred design variation) and cable-stayed design variations would result in a minimally beneficial impact on the overall visual quality of the view toward the East Span, due to the increase in its unity and vividness. The close proximity and visual dominance of the East Span mean that changes to it would substantially affect the overall visual quality of the larger view. Unity would increase more with the self-anchored suspension main span, due to the visual similarity,

prominence, and shape compared with the SFOBB West Span (which is visible from this viewpoint). With the cable-stayed main span, unity would increase over existing conditions but less than with the self-anchored suspension main span, because its shape does not echo the catenary forms of the SFOBB West Span.

Treasure Island – Viewpoint 1.

Treasure Island - Viewpoint 1 is located on the south end of TI at Clipper Cove looking east at the main portion of the East Span.

Retrofit Existing Structure Alternative. The retrofit alternative would result in a minimally adverse impact on visual quality. This impact is due to the increase in view obstruction from the addition of shear walls on support structures under the bridge toward the city and Port of Oakland (see Figure 4-10 in Appendix A).

Skyway Design Variation. The skyway design variation would result in a minimally adverse impact on the visual quality of the view toward the East Span (see Figures 4-11 and 4-12 in Appendix A). With Replacement Alternative N-6 (Preferred), this decrease would be due to reduced vividness (these impacts are somewhat offset by improved views over the East Span). With Replacement Alternative N-2, the reduction in visual quality would be due to the reduced vividness. With Replacement Alternative S-4, any reduction in visual quality would be due to reduced vividness and additional view obstruction caused by the way the columns would align.

The skyway design variations would result in a minimally adverse impact on the overall visual quality from TI. The close proximity and visual dominance of the East Span within the larger view mean that changes to it would substantially affect the overall visual quality. The reasons for the reduction in overall visual quality are the same as those cited in the preceding paragraph.

Main Span Design Variations. The self-anchored suspension (preferred design variation) and cable-stayed design variations would result in a minimally beneficial impact on the visual quality of the view toward the East Span (see Figures 4-13 and 4-14 in Appendix A). With Replacement Alternative N-6 (Preferred), this impact would be due to the increase in the vividness of the East Span because of the closer proximity of the bridge and its tower and cable systems. In addition, views of the East Bay under the bridge would be less obstructed. With Replacement Alternative N-2, there would be an increase in vividness as with Replacement Alternative N-6. However, Replacement Alternative N-2 would cause view obstruction similar to that of the existing East Span. With Replacement Alternative S-4, vividness would increase over the existing East Span, but would be less than with Replacement Alternatives N-6 and N-2, due to the poor viewing angle and increased distance to the tower and cable systems. Blockage of views to the East Bay under the bridge would be worse with Replacement Alternative S-4 when compared to the existing bridge and Replacement Alternatives N-6 and N-2.

Treasure Island – Viewpoint 2.

Treasure Island – Viewpoint 2 is located generally in the same location as Treasure Island – Viewpoint 1, but further to the east and looking south as opposed to east.

This viewpoint was added to the visual analysis in response to agency comments on the Draft EIS. As a result, this viewpoint is discussed in this FEIS, but not included in the Visual Impact Assessment technical report.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would result in a minimally adverse impact on visual quality. This impact is due to the increase in view obstruction from addition of shear walls on support structures under the bridge (see Figure 4-17a in Appendix A).

Skyway and Main Span Design Variations. The skyway and main span design variations would result in similar negligible to minimally adverse impacts on visual quality of the view toward the East Span (see Figures 4-17b and 4-17c in Appendix A). The tower and cable structures associated with the main span design variations are not visible because they are just to the east of this view. With Replacement Alternative N-6 (Preferred), there would be a negligible impact on visual quality because a similar number of columns would be visible when compared to the existing East Span. In addition, Replacement Alternative N-6 roadway decks would have a similar appearance as the existing East Span's double-decks because the side-by-side decks of the Replacement Alternatives would be separating in elevation to allow transition into the double-deck Yerba Buena tunnel.

Replacement Alternatives N-2 and S-4 would result in minimally adverse impacts on visual quality because of the additional support columns required on the island to support the side-by-side roadway decks. These columns would create additional blockage of views under the bridge when compared to the existing East Span. This adverse impact is somewhat offset by the reduced depth of the roadway deck that is provided by the side-by-side configuration of the Replacement Alternatives.

Nimitz House, Yerba Buena Island.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would result in an adverse impact on the visual quality of the view toward the East Span, due to the increase in view obstruction and shadows caused by the reinforcement of the existing columns (see Figure 4-15a in Appendix A).

Skyway Design Variation. The skyway design variation would result in a range of impacts from negligible to minimally adverse on the overall visual quality of the view toward the East Span, depending upon the replacement alternative. With Replacement Alternatives N-2 and N-6 (Preferred), there would be a minimally adverse impact, due to the increase in the number and thickness of the visible columns beneath the span. Nimitz House users would likely notice a tangible change and minimal reduction in the visual quality of this view. With Replacement Alternative S-4, there would be a negligible impact, as the increase in the intactness of the East Span (more of the length

of the East Span would be visible) would be offset by the increase in view obstruction caused by the increase in the number and thickness of the visible columns beneath the span. However, the columns would be farther away as compared to the northern replacement alternatives. This would open up the immediate foreground.

Main Span Design Variations. The self-anchored suspension (preferred design variation) and cable-stayed design variations would result in a negligible impact on the visual quality of the view toward the East Span (see Figures 4-15b and 4-15c in Appendix A). For all replacement alternatives, there is a negligible impact, because the increase in the intactness of the East Span (more of the length and/or the main span tower of the East Span would be visible) would be offset by an increase in view obstruction (due to the increase in the number and thickness of the visible columns beneath the span).

Yerba Buena Island.

This viewpoint was added to the visual analysis in response to agency comments on the Draft EIS. As a result, this viewpoint is discussed in this FEIS, but not included in the Visual Impact Assessment technical report.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would result in an adverse impact on visual quality. This impact is due to the increase in view obstruction from addition of shear walls on support structures under the bridge (see Figure 4-16a in Appendix A). The addition of the shear walls would reduce views of vegetation on the hills of Yerba Buena Island. However, the vividness and intactness of the bridge would remain relatively unchanged.

Skyway and Main Span Design Variations. Both the skyway and main span design variations would result in similar impacts on visual quality from this viewpoint because the tower and cable structures associated with the main span design variations are not visible from this viewpoint (see Figures 4-16b and 4-16c in Appendix A).

Replacement Alternative N-6 (Preferred) would result in a minimally adverse impact on visual quality. This replacement alternative would result in additional support columns being constructed on Yerba Buena Island. From this viewpoint, these columns would visually line up to create additional blockage of views of vegetation on the hills of Yerba Buena Island. Vividness of the bridge would increase with Replacement Alternative N-6 because the bridge would move closer to this viewpoint, providing a more dramatic sense of the scale of the bridge in relationship to the island and the Nimitz House. There would be a negligible change in intactness of this view because the basic elements of this view (the bridge, Nimitz House, trees and dense vegetation of Yerba Buena Island) would not be substantially changed.

Replacement Alternatives N-2 and S-4 would also result in minimally adverse impacts on visual quality, with Replacement Alternative S-4 resulting in the least adverse impact because of its more southerly location. The reduction in visual quality is primarily due to the number of columns that would be constructed on Yerba Buena Island and the

view blockage they would create. As indicated above, the intactness of this view would not change substantially with any of the replacement alternatives. Replacement Alternative S-4 would result in a slight reduction in vividness because it would be the furthest alignment from this viewpoint. While Replacement Alternative N-2 would result in a slight increase in vividness compared to the existing East Span, but somewhat less than Replacement Alternative N-6.

4.3.4 Impacts Due to the Removal of Vegetation and Slope Disturbance on Yerba Buena Island and at the Oakland Touchdown Area

Impacts

All build alternatives would require the removal of woodland vegetation. The Retrofit Existing Structure Alternative would require the removal of 150 trees, while the three replacement alternatives would require the removal of approximately 325 to 350 trees from 15 centimeters to 1.8 meters (6 inches to 6 feet) in diameter within the project's construction limits on YBI. The trees that would be removed would be within the Caltrans temporary construction easement on Navy-owned land. A large grove of mature trees, primarily eucalyptus, would be removed from the east-facing slopes of the island to accommodate any of the proposed replacement alternatives and associated temporary detours. The average height of the trees is 12 meters (39 feet). The visual impact of the existing trees is dramatic, since they soften the island's appearance from a distance and screen a number of residences on the island from the bridge. Since the current tree density on YBI constitutes a high fuel load for potential fires, the San Francisco Fire Department has proposed tree thinning on YBI to decrease the risk of fire.

The Retrofit Existing Structure Alternative would result in no vegetation loss at the Oakland Touchdown area because the area was already cleared as part of interim seismic retrofit work that occurred in 1998. All three replacement alternatives would require the removal of a number of trees within the project's construction limit on the Oakland Touchdown area. Replacement Alternatives N-6 (Preferred) and N-2 would necessitate the removal of 71 mature pine trees. Replacement Alternative S-4 would necessitate the removal of 12 mature pine trees.

The removal of this vegetation on both YBI and the Oakland Touchdown area would constitute a substantial adverse visual impact, and approximately 10 to 20 years would be required before the vegetation could reestablish itself to the density that exists today. The loss of this many trees would be highly noticeable during the construction period and subsequent years until the vegetation has reestablished itself. Views from the bridge, from the East Bay, and views westward from the eastern end of YBI would be affected by the removal of this vegetation. Table 4.3-1 includes the amount of total area disturbed and number of trees removed by alternative.

Table 4.3-1 Tree Removal Estimates

	Total Area Disturbed	Maximum Number of Trees Removed
Yerba Buena Island		
Alternative N-2	9.4 hectares/23.2 acres	350
Alternative N-6 (Preferred)	10.3 hectares/25.5 acres	350
Alternative S-4	9.4 hectares/23.2 acres	325
Retrofit	5.2 hectares/12.8 acres	150
Oakland Touchdown Area		
Alternative N-2	3.8 hectares/9.4 acres	71
Alternative N-6 (Preferred)	3.8 hectares/9.4 acres	71
Alternative S-4	5.5 hectares/13.6 acres	12
Retrofit	None	0

Source: Caltrans, August 1998.

The hillside on YBI to the south of the East Span is extremely steep and, though its steepness would restrict the amount of construction activity which would take place on it, some access would be necessary to construct temporary and permanent columns on and near it. The appearance of this slope may be permanently altered as a result of construction efforts. Returning the slope to its original grade may be difficult due to the underlying soil and geology and the steepness of the slope.

Mitigation:

Yerba Buena Island

Caltrans would develop construction limits that minimize impacts to YBI by preserving selected vegetation and maintaining some screening of structures on the island to the maximum extent possible. Specifically, special consideration would be given to preserving the two mature coast live oak trees behind Quarters 1 and all or part of the vegetation which currently screens Quarters 1 from the existing bridge. In addition, the contractor would be required to submit an access plan that would be approved by Caltrans before work on the island is begun. The plan would detail construction activities such as grading of slopes, placement of access roads, removal of vegetation, and locations of platforms needed for large equipment. Caltrans would use this construction access information to ensure that key vegetation is preserved to the maximum extent possible and to aid in tailoring a revegetation plan to pre-construction site conditions. Caltrans would then develop and implement a revegetation plan designed to reestablish vegetation in affected areas, including the planting of mature trees, monitoring, and replanting as necessary to return disturbed areas to a natural appearance and to establish visual screening of the bridge comparable to the existing condition to the maximum extent feasible. This planting plan would be developed in coordination with local agencies and implemented within two years after the bridge construction is completed. Some planting in sensitive areas may be replaced as part of the bridge construction contract.

The contractor would be required to protect the stability of the slope in areas of construction for structure footings positioned on hillside areas. Sheet pile shoring would be used to back the excavated slope and cement-modified soil backfill or other retention systems that would be conducive to revegetation would be used to stabilize the temporary detour foundations. Permanent soil stability measures such as walls and planting would be developed as part of the final design of a replacement alternative.

Oakland Touchdown Area

Mitigation for visual impacts would include development of a master planting plan in coordination with affected local agencies, including the City of Oakland, Port of Oakland, BCDC, and East Bay Regional Park District (EBRPD). The planting plan would be implemented within two years after bridge construction is completed. The Caltrans master replanting plan for the Oakland Touchdown area will be coordinated with the park design being led by the EBRPD. Replanting may take place simultaneously with the construction of the park.

4.4 AIR QUALITY

All the proposed alternatives would maintain five lanes of traffic in both directions on the East Span during and after construction and would not affect traffic volumes on or capacity of the bridge and adjacent freeways. As such, there should not be any change in air pollutant emissions from bridge traffic due to any of the proposed alternatives compared to a No-Build condition. In addition, air quality analyses are typically not required for safety projects such as the East Span Project because the Federal Transportation Conformity Rule exempts safety projects from having to include emission analyses.

However, a possible air quality issue does arise with the replacement alternatives, each of which includes a bicycle/pedestrian path. Users of a bicycle/pedestrian path would be located adjacent to the bridge roadway. A microscale carbon monoxide (CO) analysis was conducted to ensure that sufficient consideration was given to the preservation of air quality along areas of the bridge that might be used for a bicycle/pedestrian path.

This section considers the potential for exceeding state and federal ambient air quality standards for CO along the proposed bicycle/pedestrian path due to project operations. Short-term air quality impacts during construction are discussed in Section 4.14 — Temporary Impacts During Construction Activities.

4.4.1 Methodology

A microscale dispersion analysis of CO emissions was performed using the EMFAC7F emission factor model[5] and CALINE4 dispersion model[6]. Traffic along a typical replacement structure was modeled under year 2005 conditions to determine CO concentrations 5.5 meters (18 feet) from the outside edge of the travel lanes, representing the center of a bicycle/pedestrian path. There would be no other public receptors in the immediate vicinity of the bridge span.

Background concentrations for the year 2005 were determined to be 1.9 parts per million (ppm) for one-hour average and 1.3 ppm for eight-hour average. These background concentrations were determined using Bay Area Air Quality Management District (BAAQMD) isopleth maps and rollback factors[7]. Isopleth maps are maps that show contour lines of CO concentration. The contours are based on monitoring data and can be used to interpolate concentrations where there are no monitoring stations. Rollback factors are used to reduce current CO background levels as an estimate of

[5] A computer model developed by the California Air Resources Board to estimate composite on-road motor vehicle emission factors by vehicle class.
[6] A model developed by Caltrans that calculates carbon monoxide concentrations from motor vehicle uses.
[7] Bay Area Air Quality Management District, *BAAQMD CEQA Guidelines - Assessing the Air Quality Impacts of Projects and Plans*, April 1996.

future levels. It is assumed that CO levels will decline in the future because newer motor vehicles will presumably have better emission controls.

4.4.2 Impacts

Worst-case one-hour and eight-hour average CO concentrations (project roadway contribution plus background concentration) predicted by the CALINE4 model for the bicycle/pedestrian path are 2.7 ppm for a one-hour average and 1.9 ppm for an eight-hour average. These values are well below the federal and state standards. Federal one-hour and eight-hour standards are 35 ppm and 9 ppm, respectively. State standards are 20 ppm for one hour or 9 ppm for eight hours. In conclusion, neither state nor federal CO standards would be exceeded on the bicycle/pedestrian path regardless of location.

4.4.3 Air Quality Conformity

Air quality conformity evaluations for federal transportation projects and regionally significant non-federal projects are conducted pursuant to the Federal Clean Air Act Transportation Conformity Rule. A federal transportation project is defined as any highway or transit project which is proposed to receive funding assistance and approval through the Federal-Aid Highway Program or the Federal Mass Transit Program, or requires Federal Highway Administration (FHWA) or Federal Transit Administration (FTA) approval for some aspect of the project. The East Span Project is federally approved and will use federal funds (see Section 2.4.1 — Comparison of Alternatives Characteristics, Funding). As a result, the East Span Project must meet the transportation conformity requirements described in Section 3.4.1 — Air Quality, Regulatory Context of this FEIS. The East Span Project is included in the currently conforming Metropolitan Transportation Commission's (MTC) 1998 Regional Transportation Plan (RTP) approved on January 21, 1999 and the 2000/01 Federal Statewide Transportation Improvement Program (FSTIP), which includes as a component the TIP developed by MTC for the Bay Area. MTC's TIP was jointly approved on October 5, 2000 by FHWA and FTA. The design concept and scope of the proposed project have not changed since inclusion into these documents and do not interfere with the timely implementation of transportation control measures in the applicable State Implementation Plan (SIP).

Projects located in federal CO non-attainment or maintenance areas are subject to a project-level CO analysis under the federal Transportation Conformity Rule. The analysis must show that a project's build alternatives would not cause exceedances of federal CO standards. Additionally, in non-attainment areas, the project cannot generate CO emissions that would worsen existing violations or delay timely attainment of CO standards.

A microscale CO analysis was conducted, following guidance provided in the Transportation Project-Level Carbon Monoxide Protocol developed by Caltrans and the Institute of Transportation Studies at the University of California, Davis, for the project to determine project level conformity to the SIP as required by the Environmental

Protection Agency's Transportation Conformity Rule. The analysis assumptions were developed in coordination with MTC and are consistent with assumptions used in the regional emissions analysis for the RTP and TIP for those inputs required in both analyses. The analysis shows that there are no CO violations expected in the project area. Since the Bay Area is not considered a federal PM_{10} non-attainment area, PM_{10} conformity requirements in the Transportation Conformity Rule are not applicable.

Based on the above information, it is concluded that the East Span Project is in conformity with the SIP. This air quality conformity determination is in accordance with the provisions of 40 Code of Federal Regulations (CFR) Parts 51 and 93.

4.5 NOISE AND VIBRATION

Traffic noise impacts have been analyzed and are presented in this section. Traffic noise impacts are addressed using FHWA Noise Abatement Criteria (NAC) as defined in 23 CFR 772 and Caltrans approved noise policies.

4.5.1 Noise Levels on Yerba Buena Island, Treasure Island, and Oakland Touchdown Area

The noise impact analysis involved modeling for future predicted noise levels for the five alternatives (No-Build, Retrofit Existing Structure, and the N-2, N-6 (Preferred), and S-4 Replacement Alternatives). Potential impacts have been assessed for each alternative for noise-sensitive uses on Yerba Buena Island (YBI), Treasure Island (TI), and the Oakland Touchdown area. The modeled peak-noise-hour levels are shown in Table 4.5-1. A detailed noise impact assessment technical report has been prepared and is available for review at locations listed in the Preface.

In general, future predicted peak-noise-hour levels resulting from Replacement Alternatives N-2, N-6, and S-4 decrease by 1 dBA to 14 dBA compared to the existing condition. The causes of the decrease in modeled noise levels for the future replacement scenarios are:

- Construction of the bridge on YBI and the Oakland Touchdown area, using steel-reinforced concrete, would result in lower operational noise levels by eliminating radiation of sound through the bridge decks;
- Reducing noise created by vehicles traveling over new modular expansion joints[8]; and
- For the replacement alternatives, the eastbound and westbound lanes would be side by side rather than stacked, with the exception of the YBI viaduct and tunnel portal area. This would eliminate traffic noise that may be currently reflecting from the bottom of the upper deck.

Impacts

This section describes expected changes in future noise levels for the project alternatives. Receptor locations are shown on Figures 3-12, 3-13, and 3-14 in Appendix A.

No-Build Alternative and Retrofit Existing Structure Alternative. The No-Build Alternative and the Retrofit Existing Structure Alternative would not result in any increase in traffic capacity, any change in geometry, or any change in traffic speeds. Future predicted noise levels under these alternatives would remain unchanged from existing peak-noise-hour levels. Therefore, no requirement exists for a noise assessment of the No-Build Alternative and the Retrofit Existing Structure Alternative.

[8] Noise modeling assumptions for the replacement alternatives assume that the bridge structures would be constructed of concrete.

Table 4.5-1: Summary of Unabated Peak-noise-hour Levels: Existing and Future Predicted

Location #	Location	Noise Receptor	Modeled Existing Noise Level L_{eq} (dBA)	Future No-Build Noise Level L_{eq} (dBA)	Future Seismic Retrofit Noise Level L_{eq} (dBA)	Future N-2 Noise Level L_{eq} (dBA)	Future N-6 Noise Level L_{eq} (dBA)	Future S-4 Noise Level L_{eq} (dBA)
1	YBI: Houses north of bridge	1A	72	72	72	62	63	63
		1C	70	70	70	63	63	63
		1-LT	71	71	71	61	62	62
		1-M1	74	74	74	64	64	64
		1-M2	70	70	70	62	63	62
		1-M3	69	69	69	62	63	62
		1-M4	70	70	70	62	63	62
		1-M5	75	75	75	64	65	64
2	YBI: Housing north of bridge	2A	74	74	74	73	73	73
		2-M1	71	71	71	70	70	70
3	YBI: House north of bridge	3A	75	75	75	71	71	71
4	YBI: House south of bridge	4A	72	72	72	70	71	70
5	YBI: Houses south of bridge	5A	66	66	66	65	65	65
		5C	64	64	64	63	63	64
		5D	64	64	64	60	60	61
		5-M1	67	67	67	65	65	66
6	YBI: USCG housing south of bridge and below	6A	72	72	72	62	62	62
		6C	71	71	71	61	61	62
		6-M1	72	72	72	62	62	62
		6-M2	72	72	72	61	62	62
7	YBI: USCG administration complex south of bridge and below	7A	69	69	69	60	60	61
		7-M1	71	71	71	61	61	62
9	YBI: Abandoned buildings north of bridge and below	9A	76	76	76	67	67	67
		9-M1	76	76	76	67	67	67
10	YBI: Building 262 north of bridge and below	10A	77	77	77	N/A*	65	65
		10-M1	77	77	77	N/A*	N/A*	66
11	YBI: USCG base outdoor recreation area south of bridge and below	11A	75	75	75	64	64	64
		11C	77	77	77	68	68	N/A*
		11-M1	77	77	77	68	68	N/A*
		11-M2	77	77	77	69	69	69
		11-M3	77	77	77	69	69	N/A*
12	OT: Proposed Park Distr. Shoreline public access area north of bridge	12A	72	72	72	N/A*	N/A*	68
		12-M1	71	71	71	N/A*	N/A*	67
		12-M2	74	74	74	N/A*	N/A*	71
		12-LT	73	73	73	N/A*	N/A*	70
13	OT: Proposed Park Distr. Shoreline public access area south of bridge	13A	73	73	73	67	67	68
		13C	74	74	74	70	70	N/A*
		13-M1	73	73	73	67	67	N/A*
		13-M2	71	71	71	68	68	N/A*
		13-M3	71	71	71	68	68	72
17	OT: Radio Point Beach shoreline access, wildlife habitat north of bridge	17A	66	66	66	69	69	69
		17-M1	70	70	70	73	72	73
18	OT: Shoreline south of bridge	18A	69	69	69	71	70	72
		18-M1	66	66	66	68	68	69
		18-M2	65	65	65	67	67	67
20	YBI: Navy Parade Grounds north of bridge and below	20A	72	72	72	62	62	63
		20-M1	72	72	72	62	62	63
21	YBI: Cleared area north of bridge and below	21A	74	74	74	60	60	62
		21-M1	73	73	73	60	60	62
		21-M2	73	73	73	60	60	62
		21-M3	73	73	73	59	59	61
TI	TI	STUDIO	67	67	67	59	59	58

Note: YBI = Yerba Buena Island; OT = Oakland Touchdown Area; TI = Treasure Island
*** - This alternative would place the bridge above or on top of this location.**

Replacement Alternative N-2. Replacement Alternative N-2 would lie to the north of the existing East Span and transition from the double-deck viaduct to two parallel structures over YBI. Generally, future noise levels would decrease by 1 to 14 decibels compared to the existing, No-Build, and Retrofit Existing Structure Alternatives, resulting in many of the receptors experiencing future predicted noise levels below FHWA NAC. This would eliminate the need for noise abatement at these locations.

Yerba Buena Island. Future predicted peak-noise-hour levels under the Replacement Alternative N-2 at Receptor Locations 1, 6, 7, 20, and 21, (as shown on Figure 3-12) would be 7 to 14 dBA quieter than existing conditions. The future predicted noise levels at Locations 1, 5, 6, 20, and 21 are below the FHWA NAC for Activity Category B land uses (residences, recreation areas, etc.) of 67 dBA L_{eq} under Replacement Alternative N-2. At Location 7, the future predicted peak-noise-hour levels are 60 and 61 dBA L_{eq}, which are below the FHWA NAC of 72 dBA for Activity Category C (commercial land use). The future predicted noise levels at Locations 2, 3, 4, 9, and 11 would approach or exceed the 67 dBA L_{eq} standard and, therefore, there is a noise impact at those locations.

Treasure Island. Future predicted peak-noise-hour noise level at the film studio on TI with Replacement Alternative N-2 is predicted to be 59 dBA L_{eq} (see Figure 3-13 for receptor location), a decrease of 8 dBA compared with the No-Build or Retrofit Existing Structure Alternatives. This level would be below the NAC for Activity Category C (commercial uses) of 72 dBA L_{eq}.

Oakland Touchdown Area. Future noise levels under Replacement Alternative N-2 are predicted to vary from 67 dBA L_{eq} to 73 dBA L_{eq} at the receptor locations shown on Figure 3-14. Two of the 14 modeled receptors for Replacement Alternative N-2 (Receptors 17-M1 and 18-A) in the Oakland Touchdown area have future predicted peak-noise-hour levels which approach or exceed the FHWA NAC for Activity Category C of 72 dBA L_{eq}. While future predicted noise levels at the future Gateway Park would exceed the FHWA NAC of 67 dBA for Activity Category B (residences and recreational areas) and constitute a noise impact, this would occur regardless of any of the East Span build alternatives. The proposed park would be implemented following construction of the East Span Project, and park planning to date includes interagency coordination regarding ways to enhance the relationship of the transportation facility to the proposed park. While future users of the proposed Gateway Park could experience slightly higher noise levels (increases of 2 dBA) in the eastern portion of the park compared to a no-build condition, these increases would not be perceptible. Noise levels at the western end of the park would be 3 to 6 dBA lower than under the No-Build Alternative. To date, park proponents have expressed interest in retaining views rather than attenuating noise. Therefore, the East Span Project does not propose noise attenuation at the Oakland Touchdown area.

Replacement Alternative N-6 (Preferred). Generally, future predicted noise levels resulting from Replacement Alternative N-6 decrease by 1 dBA to 14 dBA

compared to the existing bridge. The lower noise levels are less than the FHWA NAC at many receptors, thus eliminating the need for abatement at these locations.

Yerba Buena Island. As shown in Table 4.5-1, with Replacement Alternative N-6 the future predicted peak-noise-hour levels at Receptor Locations 1, 6, 7, 20, and 21 would be 6 to 14 dBA quieter than existing conditions. The future predicted noise levels at Locations 1, 5, 6, 20, and 21 are below the FHWA NAC for Activity Category B land uses (residences and recreation areas) of 67 dBA L_{eq}. With Replacement Alternative N-6, the future predicted peak-noise-hour levels at Location 7 are 60 and 61 dBA L_{eq}, which are below the FHWA NAC of 72 dBA for this Activity Category C land use (commercial uses). The future predicted noise levels at Locations 2, 3, 4, 9, and 11 would have noise levels which approach or exceed the 67 dBA L_{eq} criteria constituting a noise impact.

Treasure Island. The future predicted peak-noise-hour noise level at the film studio on TI is estimated to be 59 dBA L_{eq}, a decrease of 8 dBA compared with the existing condition. The traffic noise associated with Replacement Alternative N-6 would be below the NAC for Activity Category C (commercial uses) of 72 dBA L_{eq}.

Oakland Touchdown Area. As shown in Table 4.5-1, one of the 14 modeled receptors for Replacement Alternative N-6 (Receptor 17-M1) in the Oakland Touchdown area has future predicted peak-noise-hour levels which exceed the FHWA NAC for Activity Category C (commercial uses) of 72 dBA L_{eq}; therefore, there is a noise impact. While future predicted noise levels at the planned Gateway Park will exceed the FHWA NAC of 67 dBA for Activity Category B (residences and recreation areas) and constitute a noise impact, this will occur regardless of the East Span Project. The proposed park would be implemented following construction of the East Span Project, and the park planning to date includes interagency coordination regarding ways to enhance the relationship of the transportation facility to the proposed park. While future users of the proposed Gateway Park could experience slightly higher noise levels (increases of 1 to 2 dBA) in the eastern portion of the park compared to a no-build condition, these increases would not be perceptible. Noise levels at the western end of the park would be 3 to 6 dBA lower than under the No-Build Alternative. To date, park proponents have expressed interest in retaining views rather than attenuating noise. Therefore, the East Span Project does not propose noise attenuation at the Oakland Touchdown area.

Replacement Alternative S-4. Future predicted noise levels resulting from Replacement Alternative S-4 would be similar to those from Replacement Alternatives N-2 and N-6, differing by less than one to two decibels. Generally, future predicted noise levels resulting from Replacement Alternative S-4 decrease by 1 dBA to 12 dBA compared to the existing condition. The noise level decreases associated with this alternative cause many of the receptors to be below the FHWA NAC.

Yerba Buena Island. As shown in Table 4.5-1, the future predicted peak-noise-hour levels at Receptor Locations 1, 6, 7, 20, and 21 would be 7 to 12 dBA quieter than existing conditions. The future predicted noise levels at Locations 1, 5, 6, 9, 20, and 21 meet the FHWA NAC for Activity Category B land uses (residences and recreation

areas) of 67 dBA L_{eq} under Replacement Alternative S-4. At Location 7, the future predicted peak-noise-hour levels would be 61 dBA L_{eq}, which is below the FHWA NAC of 72 dBA for Activity Category C (commercial uses). The future predicted noise levels at Locations 2, 3, 4, 9, and 11 would have noise levels which approach or exceed the 67 dBA L_{eq} criteria constituting a noise impact.

Treasure Island. The future predicted peak-noise-hour level at the film studio on TI is estimated to be 58 dBA L_{eq}, a decrease of 9 dBA compared to the existing condition. As with Alternatives N-2 and N-6, the traffic noise associated with Replacement Alternative S-4 would be below the NAC for Activity Category C (commercial uses), which is 72 dBA L_{eq}.

Oakland Touchdown Area. Four of the 14 modeled receptors in the Oakland Touchdown area (Receptors 12-M2, 13-M3, 17-M1, and 18-A) have future predicted peak-noise-hour levels which approach or exceed the FHWA NAC for Activity Category C (commercial uses) of 72 dBA L_{eq} under this alternative; therefore, there is a noise impact. While future users of the proposed Gateway Park could experience slightly higher noise levels (increases of 2 to 3 dBA) in the eastern portion of the park compared to a no-build condition, these increases would not be perceptible. Noise levels at the western end of the park cannot be quantified using the noise model because the bridge would be directly over the area, but the bridge deck itself would likely shield the area from traffic noise on the structure above. Mitigation for locations within the Oakland Touchdown area that approach or exceed NAC are not being proposed as park proponents have expressed interest in retaining views rather than attenuating noise.

Abatement

FHWA requires consideration of noise abatement (e.g., construction of a noise barrier such as a masonry wall or earthen berm) to attenuate noise when the future predicted peak-noise-hour levels approach or exceed FHWA NAC for appropriate land use categories as described in Section 3.5.3 — Noise Abatement Criteria and Analysis Guidelines. Factors to consider in evaluating noise abatement include effectiveness, cost, visual quality, and public acceptance. For the East Span Project, in which the travel lanes are on a bridge structure, such measures as earthen berms would not be possible. Buffer zones or acquiring additional right-of-way to avoid impacts are not feasible as adjacent land owners (such as the USCG) cannot be easily relocated. Abatement measures in the form of noise barriers along the roadway where it touches on YBI were evaluated in the Noise and Vibration Study for the project (a summary is presented in Appendix P and figures showing possible barrier locations are presented in Appendix A as Figures 4-18 through 4-20).

The sound walls evaluated as part of the noise analysis would not meet current FHWA-approved cost-effectiveness criteria. There are few noise-sensitive locations, and the walls would need to be very long to protect those locations, resulting in a high cost per benefited location.

In addition, the presence of sound walls would conflict with maintaining the aesthetics of the proposed bridge design and views to and from the bridge. Sound walls in which

the upper portion of the walls would have see-through panels were considered, but they were rejected for several reasons. Most importantly, Caltrans does not permit the use of see-through panels adjacent to high-speed, high-volume freeways because they have not been crash-tested. Until such testing has been done and this safety concern has been successfully resolved, see-through panels are not permitted adjacent to state highways. See-through panels would have to be cleaned on a periodic basis and would require replacement due to breakage and impacts from fog, salt water, high humidity, and ultraviolet radiation. Even with the use of see-through panels, the visual impact would still remain for viewers of the bridge and for users of the bridge.

During the public involvement process for this project, no public comments were received requesting soundwalls. Proponents of the Gateway Park have expressed interest in retaining views rather than attenuating noise.

Based on the above discussion, it has been determined that noise abatement would not be constructed as part of a replacement bridge.

4.5.2 Noise on the Bicycle/Pedestrian Path

All replacement alternatives would include a bicycle/pedestrian path along the south side of the eastbound structure. To assess future predicted noise levels on the bicycle/pedestrian path, Caltrans performed a noise study of the existing bike path adjacent to Route 24 between Orinda and Lafayette in Contra Costa County. Noise readings of 82 dBA L_{eq} were measured from the center of the bike path, a distance of 7.5 meters (24 feet), to the center of the nearest freeway lane during off-peak traffic (10:30 a.m. – 11:30 a.m.). Traffic counts were conducted and average speeds were determined. The results were then adjusted to reflect peak-period traffic on the bridge, a noisier condition. No profile grade adjustments were made. Route 24 has a profile grade of three percent, while the proposed new East Span would have a profile of less than two percent. Not adjusting for profile grade results in a conservative estimate, because a steeper grade contributes to higher noise levels from trucks.

The conclusion of the noise study was that future predicted noise on the bicycle/pedestrian path on a new East Span would be approximately 0-2 dBA higher than the Route 24 bike path, or 82-84 dBA, during the noisiest hour of the day.

The future predicted noise levels on the path are typical of those in a busy restaurant or in the kitchen with a garbage disposal running and requires shouting to be heard at 1 meter (3.3 feet); most people would perceive the noise as being loud. Two cyclists riding single-file would have difficulty communicating by shouting. The U.S. Occupational Safety & Health Administration (OSHA) has established a health-based criteria of exposure for eight hours to noise levels of 90 dBA. This level was selected to prevent hearing damage in most individuals who are subjected to the noise level for a 40-hour work week over ten years. Because noise levels on the bridge would be lower than the OSHA standard and people would be subjected to it for a period much shorter than the eight-hour period assumed for the standard, exposure to typical noise levels on the bridge would not cause hearing problems.

Other potential noise concerns for path users include the potential to be startled by short-duration loud noises. In a relatively quiet environment where cyclists and pedestrians are not expecting loud traffic noise (such as a truck passing by), these noise levels could startle an individual, resulting in possible loss of balance or control of a bicycle. Because bridge riders would experience steady elevated noise levels and trucks frequently passing by, this is not anticipated to be a substantial safety concern to bridge riders.

Since bridge path users would not experience noise levels significantly different from what users of other Bay Area bike paths adjacent to freeways would experience, Caltrans does not propose noise attenuation measures for the bicycle/pedestrian path.

4.5.3 Vibration

As noted in the affected environment section, existing vibration levels from traffic operations (i.e., heavy-truck traffic) would probably be below the levels of human perception at distances of more than 30 meters (100 feet) from the bridge support columns where ground-borne measurements were performed. Vibration levels from future bridge operations at nearby locations, including the film studios on TI, are predicted to remain below perception and criterion levels for all of the project alternatives and would be lower for the replacement bridge alternatives than for the retrofit alternative. The replacement alternatives would create less groundborne vibration compared to the existing structure due to the higher mass associated with their steel-reinforced concrete construction. There are other sources of vibrations more likely to affect operations at the film studios than bridge traffic. Possible sources include someone walking in the studio, loud music, wave action from the Bay, and wind. Construction-related vibrations from the East Span Project are discussed in Section 4.14.5 — Construction-period Noise and Vibration.

4.6 HAZARDOUS WASTES

Hazardous and contaminated materials have the potential to adversely affect human health and the environment. The design, construction, and operation of the East Span Project would incorporate design elements and construction and operation techniques to minimize these potential adverse impacts.

Caltrans will work with all potentially responsible parties and all responsible regulatory agencies to ensure that hazardous wastes the project disturbs are appropriately managed and remediated, if necessary. Additionally, the Navy has identified certain hazardous waste sites in portions of the area previously under its ownership, and if the Navy requires access from Caltrans to investigate and/or remediate such wastes, it is entitled to such access under the provisions of the land transfer.

A Hazardous Wastes Assessment report has been prepared for the East Span Project and is available for review at the locations identified in the Preface.

4.6.1 Summary and Comparison of Alternatives

Table 4.6-1 and the following subsections summarize and compare potential impacts by alternative for the Yerba Buena Island (YBI) and Oakland Touchdown areas. The discussion focuses on potentially contaminated sites discussed in Section 3.6 — Hazardous Wastes and identified on Figures 3-15a and 3-15b in Appendix A.

Yerba Buena Island

No-Build Alternative. There are no new impacts associated with the No-Build Alternative. There would be a continuation of existing conditions; i.e., lead paint continuing to flake off into the ground and into the Bay. Maintenance of the existing bridge would continue to incorporate lead-containment systems during painting.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would likely affect the following sites:

- Installation Remediation (IR) Site 29, East Side Contaminated Bridge Soils - During excavation at the bents and columns, workers may encounter materials contaminated by metals associated with past bridge operations and also by petroleum hydrocarbons;

- IR Site 8, Former Army Point Sludge Disposal Area - Construction traffic could produce airborne dust containing beryllium and lead;

- IR Site 11, Former Landfill – During pile and pile cap excavation, soil and groundwater containing metals and petroleum hydrocarbons may be encountered;

Table 4.6-1 Comparison of Alternatives: Contaminated Sites

	Alternatives				
Impact Sites	**No-Build**	**Retrofit**	**Alt. N-2**	**Alt. N-6**	**Alt S-4**
YBI Sites					
IR Site 11, Former Landfill			✓	✓	✓
IR Site 29, East Side Contaminated Bridge Soils		✓	✓	✓	✓
IR Site 8, Former Army Point Sludge Disposal Area		✓	✓	✓	✓
Fuel Lines, Building 213		✓	✓	✓	✓
Building 270[a] LUST Site			✓	✓	✓
Building 204/208[b] LUST Site			✓	✓	✓
Building 40 LUST Site			✓	✓	✓
IR Site 13, Section E, Storm Water Off-Shore Sediments					✓
SFOBB Structure		✓	✓	✓	✓
East Span					
Bay Sediment		✓	✓	✓	✓
SFOBB Structure		✓	✓	✓	✓
Oakland Touchdown Area					
Bridge footings (eastern approach area)		✓	✓	✓	✓
Army Site #1 (western end of Burma Road)					✓
Caltrans Maintenance Facility and Undeveloped Median Area			✓	✓	
EBMUD Dechlorination Facility					✓
SFOBB Structure		✓	✓	✓	✓

Source: Hazardous Wastes Assessment, September 1998.
Note: [a] Leaking underground storage tank.
[b] Buildings 204 and 208 have been removed.

- Fuel Lines, Building 213 – During pile and pile cap excavation, workers may encounter petroleum-contaminated soils beyond the fuel oil line trenches in this area (See Figure 3-15a in Appendix A); and

- San Francisco-Oakland Bay Bridge (SFOBB) Structure – Past use of lead-based paint and asbestos on the bridge structure would be of concern during bridge retrofitting activities. Asbestos-containing material may be present in bridge appurtenances. Concerns include both those associated with worker health and safety and handling and disposal of contaminated materials.

Inappropriate handling and disposal of asbestos-containing, hazardous, or petroleum-contaminated materials could degrade water quality. Inappropriate discharge of any contaminated groundwater removed from excavations could degrade water quality. Piles constructed through any existing contaminated water-bearing zone into a lower water-bearing zone could create a conduit for migration of any existing contaminants. Exposure to these materials could present potential human health hazards or adverse ecological impacts.

Replacement Alternatives N-2, N-6 (Preferred), and S-4. Construction of any of the three replacement alternatives may affect the following sites:

- IR Site 11, Former Landfill – Contaminated soil and groundwater may be encountered during pile, pile cap, drainage, and utility excavations. Contaminated groundwater may be encountered if construction of the temporary east entrance to the USCG should exceed the depth of 1.6 meters (5.4 feet) to 3.2 meters (10.6 feet) below ground surface. Soil at the landfill is contaminated with metals, polynuclear aromatic hydrocarbons, petroleum hydrocarbons, and dichlorodiphenyltrichloroethane (DDT). Soil gas emitting from the landfill may be an issue during construction of the temporary east entrance;

- IR Site 29, East Side Contaminated Bridge Soils – During removal of existing columns, construction of new columns, and drainage and utility excavations, workers may encounter soils contaminated by metals associated with past bridge maintenance and operations and also by petroleum hydrocarbons;

- IR Site 8, Former Army Point Sludge Disposal Area – Construction traffic could produce airborne dust containing beryllium and lead. Contaminated groundwater may be encountered during pile excavation;

- Fuel Lines, Building 213 – Petroleum hydrocarbon contamination beyond the fuel oil line trenches could affect the soils near the base of the columns in this area (see Figure 3-15a in Appendix A);

- Building 270/Building 40 Leaking Underground Storage Tank (LUST) Site – Construction of a temporary detour or Replacement Alternative S-4 above Buildings 270 and 40 may be affected by elevated concentrations of Total Petroleum Hydrocarbons (TPH)/diesel in soils and groundwater associated with leaking underground storage tanks;

- Building 204/208 LUST Site – Construction of replacement alternatives may affect a possible source of contamination at the Building 204/208 site. It should be noted that Buildings 204 and 208 are no longer on the site. The former fire station/gas station site appears to be located upgradient from Building 270 (referenced above) and may be a possible source of groundwater contamination identified in the groundwater monitoring well immediately upgradient of Building 270;

- SFOBB Structure – Past use of lead-based paint and asbestos on the bridge structure would be of concern during bridge dismantling activities. Asbestos-containing material may be present in bridge appurtenances.

- Buildings 30, 40, 75, 213, and 270 – Construction and maintenance of these buildings may have included the use of asbestos-containing materials and lead-based paint; and

- Lead-contaminated soil adjacent to existing roadways as a result of motor vehicle exhaust.

Replacement alternatives would require more construction activity at these sites than would the Retrofit Existing Structure Alternative. Contamination from IR Site 29 and IR Site 8 is at or very near to the ground surface. Groundwater contamination would also likely be encountered at IR Site 11, Building 270 LUST, Building 40 LUST, and possibly from Site 204/208 LUST and the fuel lines at Building 213.

In addition, Replacement Alternative S-4 would likely affect IR Site 13, Section E, Storm Water Off-Shore Sediments. Off-shore sediments from storm water discharges may have an impact due to columns being constructed within IR Site 13. Contaminants may bind to soil particles carried to the Bay by storm water runoff and deposited in the sediments.

As mentioned for the Retrofit Existing Structure Alternative, inappropriate handling and disposal of contaminated materials could degrade water quality.

Oakland Touchdown Area

No-Build Alternative. There are no new impacts associated with the No-Build Alternative. There would be a continuation of existing conditions; i.e., lead paint continuing to flake off into the ground and into the Bay. Maintenance of the existing bridge would continue to incorporate lead-containment systems during painting.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would likely encounter contamination that was detected around the bridge footings and bents of the eastern approach to the SFOBB. Contaminants of concern include total recoverable petroleum hydrocarbons (TRPH), volatile organic compounds (VOCs), pesticides, polychlorinated biphenyls (PCBs), and metals. The past use of lead-based paint and asbestos on the bridge structure would also be a concern during retrofitting activities. Concerns include both those associated with worker health and safety and handling and disposal of contaminated materials.

Replacement Alternatives N-2 and N-6 (Preferred). Replacement Alternatives N-2 and N-6 would likely encounter soil and groundwater contamination that was detected around the bridge footings and bents of the eastern approach to the SFOBB. Exposure to this source area may be less than for the Retrofit Existing Structure Alternative, because the alignment is shifted north of the existing touchdown area. As such, only the southern edge of Replacement Alternative N-2 should be close enough to the footings to disturb contaminated soil. Materials contaminated with lead from motor vehicle exhaust emissions may be encountered at excavations along the existing freeway shoulders. The past use of lead-based paint and asbestos on the bridge structure would also be a concern during construction and dismantling activities. Asbestos-containing materials may be present in bridge appurtenances.

The proposed realignment of the Caltrans maintenance road under the northern alternatives would impact the undeveloped median area near the Caltrans maintenance facility. During construction, workers may encounter soils contaminated with elevated soluble lead levels.

Replacement Alternative S-4. Replacement Alternative S-4 may affect three sites:

- Army Site #1 (western end of Burma Road) - Construction activities and dismantling of existing structures in the area of this former landfill may pose a risk to workers through direct exposure pathways of known or suspected contaminants, including petroleum hydrocarbons and tetrachloroethene via ingestion, dermal contact, or inhalation;

- East Bay Municipal Utility District (EBMUD) Dechlorination Facility - This facility uses sodium bisulfite. No testing has occurred, but there may be the presence of this compound in the soil. Construction activities may be affected by sodium bisulfite if it is present in the soil. Construction and maintenance of this building may have included the use of asbestos-containing material and lead-based paint; and

- SFOBB Structure - Past use of lead-based paint and asbestos on the bridge structure would be a concern during bridge construction and dismantling activities. Asbestos-containing material may be present in bridge appurtenances.

As mentioned in the YBI discussion, inappropriate handling and disposal of contaminated materials during construction of the build alternatives could degrade the Waters of the State.

Differences in impacts resulting from exposure to these identified contaminant sources would depend on the exact location and nature of proposed construction activities and nature and extent of contamination in these areas.

4.6.2 Further Investigations

This section identifies data gaps and describes the actions necessary to characterize the known and potential contaminant sources that may be affected by the proposed SFOBB East Span Project alternatives.

Yerba Buena Island Data Gaps

The YBI area has been fairly well characterized. Once the National Environmental Policy Act (NEPA) process is complete, a complete and thorough data review would be conducted to identify the status of existing sites and whether any new concerns have been identified. Copies of pending reports from the Navy would be requested. Results of subsurface investigations identified currently as proposed would also be requested. Current analytical data from existing groundwater monitoring wells would also be requested and analyzed.

Oakland Touchdown Area Data Gaps

While the western portion of the touchdown area along the existing East Span has been well studied, reasonable uncertainty about environmental conditions exists in several other areas. Areas needing further investigation include:

- North shore of peninsula along traffic lanes east to SFOBB Toll Plaza: this area is presently undeveloped. Historically, portions of this area were created by artificial fill;
- East of the elevated part of existing bridge approach: this area includes a thin strip of land on both sides of the traffic lanes as far east as the toll plaza. The soil in this area may contain TPH as motor oil, SVOCs, and lead; and
- Area surrounding EBMUD dechlorination tanks: this area may be the source of sodium bisulfite contamination in the soil.

Additional Investigations — All Areas

The following information will be developed during final engineering design:

- Final determination of sites that will be fully or partially acquired; and
- Determination of specific construction activities planned on or near a potential contaminant source.

Once an alternative has been selected and additional available information reviewed, a Phase II Environmental Site Investigation would be conducted for the selected alternative to sufficiently characterize contaminant management and disposal concerns during construction and to identify worker and health and safety issues that will need to be addressed. The Phase II investigation would be scoped to address identified contaminants of concern and would consider proposed construction activities. The Phase II efforts would consider the areas identified above (i.e., data gaps) for which limited data are known. All Phase II investigation efforts would focus on developing specific information about contaminated sites that could affect construction of the

selected alternative and develop hazardous wastes specifications covering handling and disposal procedures for inclusion in the construction bid documents. Phase II investigations would be limited to the level of investigation required to prepare sufficient contractor bid documents (e.g., contaminant management and health and safety procedures). Additional sampling and testing would be required during construction to ensure the proper management of contaminated media encountered.

4.6.3 Mitigation

Mitigation: All Build Alternatives.
Contaminant Management. All excavated waste material would be disposed of in conformance with federal, state, and local laws and regulations. Caltrans will work with all potentially responsible parties and all responsible regulatory agencies to ensure that hazardous wastes are appropriately managed and remediated, if necessary. If additional sampling is required to characterize the material, a sampling plan would be prepared based on guidelines in the Environmental Protection Agency publication SW 846, "Test Methods for Evaluating Solid Waste, Volume II: Field Manual Physical/Chemical Methods." Sampling and analysis would be performed prior to removing the material from the project limits.

Excavated materials that contain lead from vehicle emissions within the ranges specified in the variance granted to Caltrans by the California Department of Toxic Substance Control (DTSC) would be reused in this project or at another site within highway right-of-way along the project corridor. The materials would be placed to minimize leaching into groundwater and erosion due to wind or rain. Materials that cannot be reused in accordance with the variance will be transported to an appropriate disposal facility.

If dewatering is required to construct upland foundations and other appurtenances in areas of contaminated groundwater, the excavation would be hydraulically isolated from the groundwater by using sheet piling, casing, or other methods that would reduce the volume of groundwater discharges. In addition to reducing discharge volumes, isolation of the excavation would prevent cross-contamination of water-bearing zones.

Prior to discharge, groundwater containing contaminants, including suspended solids at concentrations that could cause adverse impacts to water quality, would be treated using the best available and economically feasible technology to reduce the concentrations of the contaminants of concern to acceptable levels in conformance with all federal, state, and local laws and regulations. The treated effluent would be reclaimed for dust control, discharged to a publicly owned treatment facility, or discharged to the Bay. If treatment of the groundwater could not be accomplished on-site, it would be transported to an appropriate off-site treatment facility.

Once the project area has been sufficiently characterized and construction activities sufficiently defined, contract specifications would be developed to address site-specific procedures for contaminant monitoring and identification, temporary storage, handling, treatment, and disposal of materials in accordance with applicable federal,

state, and local laws and regulations. Requirements for coordination with the Navy in its CERCLA responsibilities will be included.

Contingency Planning. In the event hazardous materials are unexpectedly encountered during construction, contract specifications would establish procedures for temporary stoppage of work, securing of the area, notification of the discovery, and proper management of such materials. All procedures would be consistent with Caltrans' guidelines and federal, state, and local laws and regulations and coordinated with responsible parties and regulatory agencies.

Dismantling. Contract specifications for dismantling of all structures, such as the existing SFOBB and Buildings 30, 40, 75, 270, and 213, would include procedures for the abatement, handling, and disposal of lead-based paint and asbestos, as well as the health and safety of workers and nearby residents (including USCG and Navy personnel). Prior to dismantling, asbestos and lead-based paint surveys would be performed to identify these materials. All procedures and permitting requirements would be consistent with Caltrans' guidelines and all federal, state, and local laws and regulations and coordinated with responsible parties and regulatory agencies. The Bay Area Air Quality Management District would be notified per District Regulation 11-2-401.3 – Asbestos Demolition/Renovation.

Workers performing activities on-site that may involve contact with contaminated soil, lead-based paint, asbestos, or groundwater would be required to have appropriate health and safety training in accordance with federal and state regulations. To reduce the risk of exposure, a Worker Health and Safety Plan would be prepared and implemented during construction by a Certified Industrial Hygienist (CIH). The Health and Safety Plan would include provisions for:

- Conducting preliminary site investigations and analysis of potential job hazards;
- Personal protective equipment;
- Safe work practices;
- Site control;
- Exposure monitoring;
- Decontamination procedures; and
- Emergency response actions.

The plan would address reduction of potential worker, Navy and USCG personnel, and public exposure to airborne contaminants by incorporating dust suppression techniques in construction procedures. Procedures would be in place to handle contaminated soils.

4.7 GEOLOGY, SOILS, AND SEISMICITY

This section describes the relationships between project features and expected soil conditions in the project area and also describes issues related to possible seismic events.

4.7.1 Soil and Rock Stability and Settlement

No-Build and Retrofit Existing Structure Alternatives
The No-Build and Retrofit Existing Structure Alternatives would not change area topography and, as such, would not affect slope stability within the project area. Design of the Retrofit Existing Structure Alternative has been based on current soils information, and foundation improvements would reduce the risk of settlement.

Replacement Alternatives N-2, N-6 (Preferred), and S-4
Replacement Alternatives N-2, N-6, and S-4 were developed to respond to the changing geological conditions along the general alignment, including Young Bay Muds, which cover the majority of the Bay bottom between Yerba Buena Island (YBI) and the Oakland Touchdown area. In general, sediments become increasingly thicker eastward from YBI to the Oakland Touchdown area. This means the distance to bedrock is deepest near the Oakland Touchdown, approximately 100 meters (328 feet). Construction of a main span tower is best anchored to bedrock; therefore, placing a new tower as part of a replacement alternative in the eastern portion of the project area is not feasible.

Yerba Buena Island. Initial geotechnical data indicate that several slope stability-related issues could be associated with design of the land and marine tower foundations in the vicinity of YBI. These issues include: the gross stability of the east-facing slope of YBI and the potential for slope failures in the vicinity of the west foundation for the main span.

The slope stability issues have been evaluated through geologic mapping performed on YBI, marine exploration, and laboratory testing of bedrock. Stability analyses for the various potential slope failure modes have been performed. The results show that there is no gross instability at the marine tower foundation, but wedge failures (as described in Section 3.7.3 — Geology and Geotechnical Conditions in the Project Area) are anticipated for the west column foundation on YBI. Rock anchors with or without shotcreted wire mesh and rock bolts are recommended project design features to prevent wedge failures.

There are pre-existing slope stability and erosion problems on parts of YBI in the vicinity of the USCG facility. Both have the potential to interfere with USCG operations. Slope failures and erosion may cause soils and other materials to obstruct the USCG road at the base of the hillside next to the USCG facility.

In addition, the temporary intersection which would be constructed south of the intersection on Treasure Island Road and Southgate Road would require a temporary road through an existing slope approximately 35 meters (115 feet) south of Building

206 and Quarters 8. This intersection would serve traffic exiting the bridge onto YBI on the east side of the island during the time when temporary detours are in use.

Mitigation:

Caltrans would ensure that the project does not exacerbate pre-existing problems within Caltrans' right-of-way or its temporary construction easements either during or after construction. Consultation with the USCG and collection of information on slope stability prior to and during construction would be conducted.

Caltrans will require the contractor to prepare a conceptual plan for slope stability and erosion control on the hillside above the USCG facility. This plan would include Best Management Practices (BMPs) to reduce impacts from storm water runoff which can cause erosion. Caltrans would solicit comments on the conceptual plan from the USCG. Caltrans would be responsible for implementation of the plan. The conceptual plan would be adjusted and revised during construction based on site conditions identified during construction.

Caltrans would monitor the hillside within the project right-of-way and temporary construction easements to detect ground movements during construction that may be associated with project construction activities. If Caltrans determines that slope stability problems are due to its construction, it would correct the problem. Caltrans would prepare a slope restoration concept using standard practices and techniques and would solicit comments from the USCG after which it would finalize and implement the restoration plan.

In order to minimize the impact to the slope from construction of the temporary road, temporary retaining walls would be used. The ramps would be reconstructed and the excavation required for construction of the wall would be filled in.

Oakland Touchdown Area. The fill material at the end of the Oakland shore from the current ground elevation to between 3 and 5 meters (10 and 16 feet) below mean sea level (MSL) is potentially liquefiable material. The potential for liquefaction exists for the fill that lies beneath the water table. Liquefaction is the loss of strength that can occur in loose, saturated soil during or following seismic shaking. The loss of strength is due to the tendency of loose soils to contract and compress when shaken. In a seismic event, liquefaction can produce a number of ground effects, including lateral spreading, boils, ground lurching, and settlement of the fill material. In the case of the Oakland Touchdown, damage would most likely consist of small earth slumps, differential settlement, and cracking of fill embankments. Such damage could be quickly repaired. Pile-supported structures on the Oakland Touchdown would be subject to impacts from liquefaction, such as induced loads, but these structures are designed to accommodate these impacts and would meet lifeline criteria.

To compensate for potential settlement at the Oakland Touchdown area, at-grade approach structures would be created by placing embankment fill on certain sections of the landfall that may be prone to settlement due to consolidation of the soft clay and partially in the Bay to further support approach structures.

The westbound fill design includes the following components to address soil settlement issues:

- Improvement of the existing hydraulically placed sand fill by installation of vertical pipe drains;
- Installation of wick drains to the bottom of the compressible Young Bay Mud layer beneath the new embankment fill to accelerate consolidation settlement and associated shear strength gain;
- Staged placement of embankment fill with geotechnical monitoring to maintain slope stability; and
- Replacement of portions of the embankment fill or existing fill with lightweight cellular concrete fill.

The eastbound and maintenance road fill design takes advantage of the need for relatively low fill heights (4.5 meters [14.8 feet]) and their inland position away from the shoreline. Existing fill would be excavated and replaced to higher grades with lightweight cellular concrete fill.

4.7.2 Seismicity

The project area will likely experience strong to very strong seismically induced ground shaking within the design life of all build alternatives. Under all replacement alternatives, some damage to bridge components would be expected to occur during a major seismic event; however, the components should still be able to substantially perform their design functions. In general, strong ground shaking can cause one or more of the following:

- Densification of loose granular soils;
- Cracking, spreading, and settlement of embankment material;
- Failure of embankments and natural slopes;
- Liquefaction (which can contribute to settlement, slope failure, spreading, and forces on structures); and
- Structural distress to bridges, retaining walls, and culverts.

Surface fault rupture and resulting displacement is not expected since there are no known active faults along the alignments.

No-Build Alternative

Under the No-Build Alternative, the existing East Span would be able to withstand a moderate earthquake. However, it is anticipated that the existing East Span would

experience multiple failures at structure joints and potential collapse into the Bay in the event of a Maximum Credible Earthquake (MCE).

Retrofit Existing Structure

The Retrofit Existing Structure Alternative would provide additional support to the existing East Span compared to the No-Build Alternative. Following retrofit construction, the bridge should be able to withstand an MCE. However, it is anticipated that in the event of an MCE, the retrofitted East Span would experience damage to truss members in the steel superstructure. The addition of new Columns E2A and E2B would eliminate an existing imbalance in the existing main span, which would reduce structural damage. Although the retrofitted main span would be expected to withstand an MCE or smaller event, it is likely that the main span structure (the cantilever section), and potentially other shorter spans, would require extensive repair (possibly requiring closure of the bridge for a six-month to one-year period) or complete replacement of the entire structure, depending on the extent of the damage.

Replacement Alternatives N-2, N-6 (Preferred), and S-4

The replacement alternatives are designed to meet current lifeline seismic safety standards. It is expected that replacement alternatives would withstand an MCE on the San Andreas or Hayward faults. Seismic design criteria for all replacement alternatives are intended to ensure both non-collapse and serviceability of structures when subjected to ground motions during a seismic event.

Potential for damage resulting from an MCE exists. The main span tower structure near YBI would be sited on shallow, sloping bedrock, requiring foundations deep into rock. Damage due to tower settlement in an MCE would most likely be minor and confined to local deflection, cracking, and misalignment of pavement on the main span. Anticipated damage could easily be repaired to permit the East Span to serve a lifeline function.

4.7.3 Tsunamis

The possibility of tsunamis in the Bay Area would most likely be related to a seismic event. Based on U.S. Geological Survey (USGS) map information, it appears that most of the Oakland Touchdown area, which ranges in elevation from about 0 to 3.6 meters (0 to 12 feet) would be subject to inundation from a 200-year-return-period tsunami. At lower return periods (for example, 25 to 100 years), the potential for inundation decreases substantially.

The impacts of a tsunami would be flood damage, erosion, and damage caused by wave and water forces on structures. People, automobiles, and buildings could be washed away as during a flood. Tsunami warnings are a component of the regional emergency warning system and would be implemented in the case of a threat of tsunami inundation.

The structural design of the existing East Span and the replacement structure on the Oakland Touchdown area includes the capability of resisting water/wave/current-induced loading.

4.8 WATER QUALITY

This section discusses potential impacts to water quality in the project area and associated control measures. For each of the replacement alternatives, the water quality impacts and design considerations discussed in this section would be the same.

4.8.1 Surface Water Quality

No-Build Alternative

The No-Build Alternative would not modify current water quality conditions as current methods of operation and maintenance would continue. The current practice of sweeping the bridge decks would continue and storm water would continue to discharge directly into the Bay.

Retrofit Existing Structure Alternative

The Retrofit Existing Structure Alternative may have a temporary water quality impact during construction activities. These activities may include dredging, dewatering, concrete pouring, welding, and other activities that have the potential to impact water quality (see Section 4.14.7 — Temporary Impacts, Water Resources and Water Quality for discussion of construction-related impacts). Potential long-term impacts have also been evaluated, and it has been determined that there are no long-term impacts because the existing facility would not be modified in terms of its operation and drainage system. The current practice of sweeping the bridge decks would continue and storm water would continue to discharge directly into the Bay.

Replacement Alternatives N-2, N-6 (Preferred), and S-4

All replacement alternatives have similar potential to affect water quality in San Francisco Bay, both during and after construction (see Section 4.14 — Temporary Impacts During Construction Activities for discussion of construction-related impacts).

The replacement alternatives would consist of two parallel bridge decks, each accommodating five standard travel lanes and standard shoulders. The overall width of the westbound bridge deck is proposed to be 25 meters (82 feet). The width of the eastbound bridge deck, which includes a 4.7-meter (15.5-foot) bicycle/pedestrian path, is proposed to be 29.7 meters (97.5 feet). The replacement alternatives would increase the surface area exposed to precipitation. A corresponding increase in the quantity of pavement storm water runoff from the East Span during a rainfall event is expected; however, variances in the frequency and intensity of such events make efforts to determine specific volume increases unreliable.

Pollutants commonly found in highway storm water runoff include heavy metals, oil and grease, suspended and dissolved solids, nutrients, bacteria, and some of the hydrocarbons in the gasoline and diesel range. Pollutants less common in highway storm water runoff include volatile organics, semi-volatile organics, phenols, pesticides, polychlorinated biphenyls, and synthetic biocides, depending on the characteristics and location of the highway.

Impacts. Similar to the existing condition, all storm water runoff on a replacement bridge would flow into the Bay.

The proposed replacement alternatives would not be expected to increase concentration levels of those pollutants commonly found in highway runoff, nor is the design expected to elevate the levels of less common constituents. The existing pollution mass is based on total vehicle hours on the structure. For the total mass of pollution to change, either the total usage hours must increase or the pollutant generation rate must increase. Given that the improvements in operations on a replacement bridge should decrease the generation rate due to reduction in stop-and-go traffic, the actual mass of pollutants should decrease. Increased interception of rainfall on a wider structure would not increase the mass of pollutants. In other words, the bridge runoff quantity is not linked to pollutant mass.

The bridge deck drainage area and total runoff volume compared to the overall existing watershed area is on the order of magnitude of 1 to 10^6. Based on this relatively small runoff volume, the pollutant loads would be negligible when compared to the overall pollutant loadings to the Bay from the entire watershed and would not have a net impact on the overall water quality of the Bay.

Water Quality Benefits. There are inherent water quality benefits in the design of the replacement bridge, especially when the features are compared to the existing bridge. Bridge runoff quality is expected to be improved based on the following features:

- Standard Shoulders – The addition of 3-meter (10-foot) wide shoulders would decrease the response time of emergency teams to accidents and spills, thereby increasing the chances that spilled material would not be discharged into the Bay. Emergency vehicles would be able to utilize the shoulders in response to accidents and spills on the replacement structure, whereas the existing bridge requires that traffic be cleared to allow access for emergency vehicles. The shoulders would also provide space for disabled vehicles to be moved so that they do not block traffic, thereby maintaining highway speeds. This would reduce pollutants produced by vehicles as a result of stop-and-go traffic. Additionally, traffic shoulders would allow for improved sweeping operations on a replacement structure, by allowing sweeper vehicles to travel at slower speeds and conduct sweeping operations without the need for lane closures and traffic obstruction.

- Standard Lanes – The lane widths would be increased from 3.5 meters (11.7) feet to 3.7 meters (12 feet). Standard lane widths, in combination with standard shoulders, provide an increased improvement in traffic flow patterns. The improved traffic flow would reduce the amount of stop-and-go traffic on the bridge, thereby reducing those pollutants attributable to stop-and-go traffic.

- Sight Distance – Improvements to the superelevation, vertical and horizontal curvature, and elimination of a double-decked structure would increase sight distances. Increases in sight distances allow drivers to better anticipate changes in roadway conditions and to maintain consistent and comfortable driving speeds.

These benefits reduce accidents and the amount of stop-and-go traffic on the bridge, thereby reducing pollutants attributed to these conditions.

- Concrete Structure – A replacement structure would be a predominantly concrete structure that would have limited exposed steel, which reduces the need for painting and paint removal. Painting would occur once every 10 to 15 years. The portions of a replacement structure that would have exposed steel would be painted with a non-lead paint. Complete containment of residues and liquids from paint removal operations on a replacement structure would continue to be limited due to accessibility and safety. Paint removal operations for vertical surfaces and the cables on a replacement structure would involve the lowest amount of containment due to limited access for maintenance personnel and a lack of available supports for containment structures. The expected high volume elimination of lead paint removal and painting on a replacement structure should provide a long-term reduction in adverse water quality impacts associated with maintenance of the existing structure, since the source of these pollutants, the existing bridge structure, would be removed.

In addition to the benefits provided by a replacement bridge and the removal of the lead source, there are several measures already in place that would continue to help prevent the discharge of pollutants to the Bay. Caltrans has an aggressive emergency response plan for responding to spills of varying magnitudes on the highway system. The current emergency response plan includes monitoring cameras, call boxes, and a 24-hour towing service. The towing service constantly patrols the entire span of the bridge while remaining in communication with both Caltrans and Highway Patrol staff that monitor the bridge via the aforementioned cameras. This plan is updated annually to ensure that on-call contractors have the proper training, equipment, and procedures to respond to spills. In addition to this plan, Caltrans and the California Highway Patrol would continue to prohibit the transportation of hazardous and flammable materials across the bridge.

Considering the design features of the new bridge, the project as planned is expected to improve the overall water quality of bridge runoff.

Best Management Practices. Several best management practices (BMPs) for addressing potential pollutants generated by storm water runoff within the project limits were evaluated. This evaluation was based on right-of-way requirements (area), constructibility, maintenance, safety, feasibility, and cost-effectiveness. Caltrans has prepared a Treatment BMP Feasibility Study for the East Span Project, which describes the evaluation in more detail. This report was submitted to the RWQCB and is available for review at Caltrans District 4 offices

The pollutants addressed in the evaluation are:

- Metals;
- Sediment;
- Oil and grease;
- Bacteria; and

- Nutrients.

These pollutants can potentially be treated by various techniques such as constructed wetlands, detention basins, infiltration basins, infiltration trenches, and sweeping. Some techniques can treat more than one pollutant. Most of the BMPs are land-based facilities (i.e., constructed wetlands, detention basins, infiltration trenches, etc.) that require storm water to be collected and piped off the bridge to a land-based facility. These land-based facilities were not considered to be appropriate primarily because of the high cost associated with placing the piping system on the bridge in contrast to the amount of pollutant removal benefit obtained. The conditions that resulted in the BMPs being considered infeasible are summarized as follows:

- All the BMPs considered would require construction of additional piping on the bridge structure. Due to the high cost and difficulty of construction, piping on the bridge and therefore all BMPs were considered infeasible.

- Infiltration trenches and swales – This BMP requires a large and elongated area to be effective in handling the expected flows from a replacement structure and it relies on pollutant removal by filtration through vegetation, sedimentation, adsorption to soil particles, and infiltration through the soil. For the East Span Project, nearby land-based right-of-way for an adequate trench is limited, and shallow groundwater and low soil permeability would inhibit infiltration.

- Oil/water separators – This BMP is designed to operate at a constant (controlled) flow rate and to remove large amounts of oil and grease from flows with high concentrations. A pump may be required for each separator to facilitate the flow through the system, which requires a power source and adequate space for its installation. Oil/water separators also require a high degree of maintenance for keeping them cleared of debris and other harmful materials. The variable (fluctuating) and high (large volume) flow rates along with relatively low concentrations of oil and grease expected from the storm water runoff at the project site renders such a system ineffective and impractical.

- Infiltration Basins – Sites for this BMP were available, but the high groundwater and low soil permeability inhibits infiltration. The major impediment to infiltration is that the Oakland Touchdown area is composed of fill material, which was most likely to have been compacted upon its initial placement.

- Dry Weather Flow Diversion – This BMP directs flow through a pipe or channel to a local municipal sanitary sewer system for treatment at a local wastewater treatment plant during dry weather. Opportunities for connecting to a sanitary sewer are available; however, the persistence of any dry weather flow from the bridge is not evident. Therefore the limited effect of such a system does not outweigh the significant costs attributed to the piping systems needed to make the conveyance feasible.

- Constructed Wetland – There is currently insufficient data about the effectiveness of this BMP to efficiently remove pollutants from highway runoff. The planned land use

adjacent to a possible constructed wetland site includes the future Gateway Park that will be managed by the East Bay Regional Park District. This raised concerns about conflicts with the proposed park as well as safety and health concerns related to the use of secondary treated water as the main source for establishing and nurturing wetland vegetation. As a result of the unknown effectiveness of this BMP and anticipated land use conflicts, piping storm water to a constructed wetland was determined to be not practical.

- Detention Basin – This BMP was considered to be the most appropriate device for implementation. The basin would need to be lined in order to negate the effects of groundwater. However, as described in the Treatment BMP Feasibility Study, the high cost of implementing a piping system on the bridge outweighs the benefits of pollutant removal.

Caltrans is investigating the effectiveness of enhanced sweepers such as vacuum and regenerative air sweepers to vacuum up the fine particles to which pollutants adhere. Because a replacement bridge would have shoulders and wider lane widths, sweeping effectiveness is expected to be improved; however, enhancement of the sweeper equipment is expected to be consistent with the decisions made for sweeping on a statewide basis. Currently such enhanced sweepers have technological limitations that call their effectiveness into question. These include problems maintaining the vacuum between the machinery and the pavement which is essential to the effectiveness of the device; the tendency of the equipment to act as a plow, pushing the fine materials into drainage outlets; and reduced performance of the equipment on rough pavement.

4.8.2 Groundwater Quality

All Project Alternatives

There are no known long-term impacts to groundwater quality as a consequence of the construction of this project. Section 4.14.7 discusses the potential construction-related water quality impacts, including impacts to groundwater. These would be mitigated with the proper implementation of a Storm Water Pollution Prevention Plan (SWPPP) developed for this project as required by NPDES Permit No. CAS000003. See Section 4.14.7 — Temporary Impacts, Water Resources and Water Quality for more details. The SWPPP would address all construction management practices that have the potential to impact water quality and would identify appropriate control measures to be taken by the Contractor to minimize such potential impacts. The SWPPP will include specific Best Management Practices (BMPs) to be implemented to control and prevent the discharge of pollutants to surface waters as well as groundwater. These BMPs may include dewatering, controlling spills and concrete, sediment control using silt fences.

4.9 NATURAL RESOURCES

Permanent or temporary impacts to natural resources may occur in association with the build alternatives. This section discusses permanent impacts to wildlife species or habitat. Natural resources in the project area were evaluated in accordance with the provisions of state and federal environmental statutes and regulations listed in Section 3.9.1 — Natural Resources, Regulatory Setting. Mitigation measures, where appropriate, have been developed in consultation with regulatory and permitting agencies. Conceptual mitigation measures are described in Section 4.9.6 — Natural Resources, Mitigation.

Four resource and impact categories are discussed below: (1) permanent fill in San Francisco Bay (including opening and shallow water areas and special aquatic sites) and permanent fill in Other Waters of the U.S. (including open and shallow water areas); (2) special aquatic sites such as wetlands, eelgrass beds, or sand flats; (3) special status species such as endangered species, migratory birds, marine mammals, and fisheries; and (4) other natural resources such as coast live oak woodlands.

Temporary impacts to natural resources are identified as impacts from construction activities and are limited to the duration of construction as described in Section 4.14 — Temporary Impacts During Construction Activities.

4.9.1 Placement of Fill in San Francisco Bay

Placement or removal of fill in San Francisco Bay and Other Waters of the U.S. are subject to federal and state regulations. The ACOE regulates fill in Other Waters of the U.S. pursuant to Section 404 of the federal Clean Water Act (CWA). BCDC regulates fill in San Francisco Bay pursuant to the state McAteer-Petris Act. These regulations define fill differently.

Clean Water Act

The CWA is a 1977 amendment to the federal Water Pollution Control Act of 1972, which established regulations for discharging pollutants to Waters of the U.S., such as San Francisco Bay. The primary objective of the CWA is to restore and maintain the physical, chemical, and biological integrity of the nation's waters. The ACOE administers the CWA.

The CWA considers placement of fill in Waters of the U.S. as a negative impact because it may reduce the volume and surface area of water bodies. Under the CWA, fill is defined as "material used for the primary purpose of replacing an aquatic area with dry land, or a change in the bottom elevation of a water body" (Section 404, article 323.2.). Removal of fill is recognized as a beneficial impact because it may result in the restoration or maintenance of the physical, chemical or biological integrity of the nation's waters.

San Francisco Bay's shallow and open water areas are referred to in the text below as Other Waters of the U.S. The analysis of fill in Other Waters of the U.S. does not

include fill in special aquatic sites such as wetlands, eelgrass beds, or sand flats. Impacts to special aquatic sites, as defined by the ACOE, are addressed separately in Section 4.9.2 — Special Aquatic Sites. Under the CWA, the ACOE considers fill in Other Waters of the U.S. to be solid material placed in jurisdictional waters below the mean high water line (MHW), which is approximately +1.42 meters National Geodetic Vertical Datum (NGVD) (+4.63 feet) at YBI and the Oakland Touchdown area.

Net Change in Volume of Other Waters of the U.S. - ACOE.

All replacement alternatives (N-2, N-6, and S-4) would increase the volume of Other Waters of the U.S. as compared to its current volume. Although the replacement alternatives would result in new fill in Other Waters of the U.S. as defined by the ACOE, removal of dredged sediments and the removal of the existing bridge would offset the volume of the new fill. The volume of Other Waters of the U.S. would increase as a result of the following construction activities:

- Removing dredged sediments to create a barge access channel for construction of the replacement alternatives;
- Removing dredged sediments to install piles for the replacement alternatives;
- Removing dredged sediments to create a barge access channel to remove the existing structure;
- Removing dredged sediments to dismantle the existing bridge piles below the mud line; and
- Removing the existing bridge piers and fenders.

Because the replacement alternatives would increase the volume of Other Waters of the U.S., they would have a beneficial impact on Other Waters of the U.S.

The Retrofit Existing Structure Alternative would decrease the volume of Other Waters of the U.S. as compared to its current volume. The Retrofit Existing Structure Alternative requires dredging only to install piles and does not remove the existing bridge. Because the retrofit alternative would decrease the volume of Other Waters of the U.S., it would have a negative impact on Other Waters of the U.S.

Table 4.9-1 summarizes the approximate net change in volume of Other Waters of the U.S. that would occur as a result of the build alternatives.

Table 4.9-1 Net Change in Volume of Other Waters of the U.S. – ACOE

	Build Alternatives			
Activity	**N-6**	**N-2**	**S-4**	**Retrofit**
New Fill from Construction (reduction in volume)	50,400 cubic meters (66,000 cubic yards)	50,400 cubic meters (66,000 cubic yards)	72,100 cubic meters (94,400 cubic yards)	142,300 cubic meters (186,200 cubic yards)
Removal of Sediment (increase in volume)[a]	371,000 cubic meters (485,300 cubic yards)	371,000 cubic meters (485,300 cubic yards)	375,000 cubic meters (490,500 cubic yards)	116,000 cubic meters (152,000 cubic yards)
Removal of Existing Bridge Piers and Fenders (increase in volume)	65,400 cubic meters (85,600 cubic yards)	65,400 cubic meters (85,600 cubic yards)	65,400 cubic meters (85,600 cubic yards)	N/A
Net Change in Volume of Other Waters of the U.S.	Increase of: 386,000 cubic meters (504,900 cubic yards)	Increase of: 386,000 cubic meters (504,900 cubic yards)	Increase of: 368,300 cubic meters (481,700 cubic yards)	Decrease of: 26,300 cubic meters (34,200 cubic yards)

Source: Caltrans 2000.

[a] Removal of sediments for barge access and to prepare for pile installation increases the volume of Other Waters of the U.S. The removal of sediment does not include that portion of the barge access channel that will be restored for eelgrass habitat under the replacement alternatives as described in Section 4.9.6 — Natural Resources, Mitigation. Up to 32,100 cubic meters (42,000 cubic yards) of dredged material may be used to restore a portion of the barge access channel to pre-existing bathymetry.

Net Change in Surface Area of Other Waters of the U.S. – ACOE.

The ACOE also measures fill in Other Waters of the U.S. by surface area. All build alternatives would decrease the surface area of Other Waters of the U.S. as compared to its current surface area. Although all the build alternatives would remove sediments for barge access and to prepare for pile installation and would remove the existing bridge, the fill removal would not offset the surface area of the new fill in Other Waters of the U.S. Since the sediments are submerged, their removal does not contribute to an increase in the surface area of Other Waters of the U.S.

Because the build alternatives would decrease the surface area of Other Waters of the U.S., they would have a negative impact on Other Waters of the U.S. Table 4.9-2 summarizes the approximate net change in surface area of Other Waters of the U.S. that would occur as a result of the build alternatives.

Table 4.9-2 Net Change in Surface Area of Other Waters of the U.S. – ACOE

	Build Alternatives			
Activity	**N-6**	**N-2**	**S-4**	**Retrofit**
New Fill from Construction (reduction in surface area)	1.06 hectares (2.61 acres)	1.06 hectares (2.61 acres)	1.73 hectares (4.29 acres)	1.70 hectares (4.19 acres)
Removal of Existing Sediment[a]	N/A	N/A	N/A	N/A
Removal of Existing Bridge Piers and Fenders (increase in surface area)	0.80 hectare (1.98 acres)	0.80 hectare (1.98 acres)	0.80 hectare (1.98 acres)	N/A
Net Change in Surface Area of Other Waters of the U.S.	Decrease of 0.26 hectare (0.63 acre)	Decrease of 0.26 hectare (0.63 acre)	Decrease of 0.93 hectare (2.31 acres)	Decrease of 1.70 hectares (4.19 acres)

Source: Caltrans 2000.
[a] Removal of submerged sediments to create barge access and to prepare for pile installation does not increase the surface area of Other Waters of the U.S.

McAteer-Petris Act

On the regional level, the San Francisco Bay Conservation Development Commission (BCDC) administers the McAteer-Petris Act, which was enacted by the state legislature in 1965. The McAteer-Petris Act recognizes that San Francisco Bay is a significant economic, environmental, and recreational resource. BCDC was established to address indiscriminant filling of San Francisco Bay.

The McAteer-Petris Act generally identifies the placement of fill in San Francisco Bay as a negative impact since it may reduce the Bay's surface area and volume. Reducing the surface area and volume of the Bay impairs its ability to maintain adequate oxygen levels and assimilate and flush wastes. Removal of fill is considered a beneficial impact to the Bay and is consistent with the McAteer-Petris Act because it may increase the volume and surface area of the Bay.

As defined by BCDC, Bay fill is any solid, pile-supported, floating, cantilevered or suspended material that is placed bayward of the Mean High Tide Line (MHTL) which is approximately +0.82 meters NGVD (+2.68 feet) at YBI and +0.84 meters NGVD (+2.77 feet) at the Oakland Touchdown area, or the +1.5-meter (5.0-foot) contour line where marshlands are present. Unlike the ACOE, the analysis of fill in BCDC's jurisdiction includes fill placed in special aquatic sites such as wetlands, eelgrass beds, and sand flats.

Net Change in Volume of San Francisco Bay – BCDC.

All replacement alternatives would increase the volume of San Francisco Bay as compared to its current volume. Although the replacement alternatives would result in new fill in San Francisco Bay as defined by BCDC, removal of dredged sediments and the removal of the existing bridge would offset the volume of the new fill. The volume of

San Francisco Bay would actually increase as a result of the following construction activities:

- Removing dredged sediments to create a barge access channel for construction of the replacement alternatives;
- Removing dredged sediments to install piles for the replacement alternatives;
- Removing dredged sediments to create a barge access channel to remove the existing structure;
- Removing dredged sediments to dismantle the existing bridge piles below the mud line; and
- Removing the existing bridge piers and fenders.

Because the replacement alternatives would increase the volume of San Francisco Bay, they would have a beneficial impact on the Bay.

The Retrofit Existing Structure Alternative would decrease the volume of San Francisco Bay as compared to the current volume. The Retrofit Existing Structure Alternative requires dredging only to install piles and does not remove the existing bridge. Because the Retrofit Existing Structure Alternative would decrease the volume of San Francisco Bay, it would have a negative impact on the Bay.

Table 4.9-3 summarizes the approximate net change in volume of San Francisco Bay that would occur as a result of the build alternatives.

Table 4.9-3 Net Change in Volume of San Francisco Bay – BCDC

	Build Alternatives			
Activity	**N-6**	**N-2**	**S-4**	**Retrofit**
New Fill from Construction (reduction in volume)	78,900 cubic meters (103,200 cubic yards)	78,900 cubic meters (103,200 cubic yards)	67,800 cubic meters (88,700 cubic yards)	132,500 cubic meters (342,700 cubic yards)
Removal of Sediment (increase in volume)[a]	371,000 cubic meters (485,300 cubic yards)	371,000 cubic meters (485,300 cubic yards)	375,000 cubic meters (490,500 cubic yards)	116,000 cubic meters (152,000 cubic yards)
Removal of Existing Bridge Piers (increase in volume)	60,300 cubic meters (78,800 cubic yards)	60,300 cubic meters (78,800 cubic yards)	60,300 cubic meters (78,800 cubic yards)	N/A
Net Change in Volume of the Bay	Increase of 352,400 cubic meters (460,900 cubic yards)	Increase of 352,400 cubic meters (460,900 cubic yards)	Increase of 367,500 cubic meters (480,600 cubic yards)	Decrease of 16,500 cubic meters (21,300 cubic yards)

Source: Caltrans 2000.

[a] Removal of sediments for barge access and to prepare for pile installation increases the volume of San Francisco Bay. The removal of sediment does not include that portion of the barge access channel that will be restored for eelgrass habitat under the replacement alternatives as described in Section 4.9.6 — Natural Resources, Mitigation. Up to 32,100 cubic meters (42,000 cubic yards) of dredged material may be used to restore a portion of the barge access channel to pre-existing bathymetry.

Net Change in Surface Area of San Francisco Bay – BCDC.

BCDC also measures fill in San Francisco Bay by surface area. BCDC's definition of fill includes high-level suspended fill such as bridge decks or other structures that are placed bayward of the Mean High Tide Line. BCDC considers the footprint of the bridge decks to be fill even where the bridge decks are placed at a significant height above the Bay and generally do not result in adverse impacts to the Bay such as permanent shading of special aquatic sites.

The Retrofit Existing Structure Alternative would not result in a change to the surface area of the Bay as defined by BCDC because the new fill would be placed within the footprint of the existing bridge deck.

When compared to the high-level suspended fill for the existing bridge, the single side-by-side deck configuration for all replacement alternatives (N-2, N-6 and S-4) would result in a net decrease in the surface area of San Francisco Bay. Although all the replacement alternatives would remove sediments for barge access and to prepare for pile installation and would remove the existing bridge, the fill removal would not offset

the surface area of new fill in San Francisco Bay: since the sediments are submerged, their removal does not contribute to an increase in the surface area of the Bay.

Because the replacement alternatives would decrease the surface area of San Francisco Bay, they would have a negative impact on the surface area of the Bay.

Table 4.9-4 summarizes the approximate net change in surface area of San Francisco Bay, including the loss of Bay surface area associated with high-level suspended fill, that would occur as a result of the replacement alternatives.

Table 4.9-4 Net Change in Surface Area of San Francisco Bay - BCDC

	Build Alternatives			
Activity	**N-6**	**N-2**	**S-4**	**Retrofit**
New Fill from Construction (reduction in surface area)[a]	19.02 hectares (47.01 acres)	18.09 hectares (44.90 acres)	17.36 hectares (42.90 acres)	N/A
Removal of Sediment[b]	N/A	N/A	N/A	N/A
Removal of Existing Bridge Deck (increase in surface area)	5.06 hectares (12.50 acres)	5.06 hectares (12.50 acres)	5.06 hectares (12.50 acres)	N/A
Net Change in Surface Area of the Bay	Decrease of 13.96 hectares (34.51 acres)	Decrease of 13.03 hectares (32.40 acres)	Decrease of 12.30 hectares (30.40 acres)	N/A

Source: Caltrans 2000.
[a] Includes coverage of Bay surface area from two parallel bridge decks, which are considered high-level suspended fill.
[b] Removal of submerged sediments to create barge access and to prepare for pile installation does not increase the Bay surface area.

4.9.2 Special Aquatic Sites

Impacts to special aquatic sites, including wetlands, sand flats, and eelgrass beds, are subject to ACOE jurisdiction under Section 404 of the Clean Water Act and BCDC jurisdiction under Section 66605 of the McAteer-Petris Act. Sand flats in the project area provide feeding and resting habitat for shorebirds, and eelgrass provides spawning habitat for herring, among other functions. Section 3.9.3 — Estuarine Environment and Associated Species and Section 3.9.7 — Wetlands and Waters of the U.S. describe the functions and values of special aquatic sites. Table 4.9-5 presents a summary of permanent impacts to special aquatic sites. Temporary impacts are presented in Section 4.14.8 — Temporary Impacts, Natural Resources. A discussion of permanent impacts to special aquatic sites, including jurisdictional wetlands, is provided below.

No-Build and Retrofit Existing Structure Alternatives

The No-Build and Retrofit Existing Structure Alternatives would not affect wetlands, sand flats, or eelgrass beds. Special aquatic sites would be identified as environmentally sensitive areas (ESAs) and marked in the field to prevent disturbance from construction activity.

Table 4.9-5 Permanent Impacts to Special Aquatic Sites and Mitigation Measures

	Wetlands	Sand Flats	Eelgrass Beds
Project Habitat	The tidal wetlands in the project area are located along the north shore of the Oakland Touchdown area and the north side of YBI. These wetlands possess a moderate level of functions and values since they contain non-native plant and animal species. These wetland areas do not provide extensive habitat for wildlife and are not considered high quality. There is 0.5 hectare (0.12 acre) of two non-tidal wetlands located on the southern portion of the Oakland Touchdown area. These wetlands have limited functions and values due to human disturbance and lack of wetland species diversity. They are unlikely to provide habitat for wildlife species.	The sand flats located within the project area occur along the north side of the Oakland Touchdown area. These sand flats provide a moderate level of functions and values for plankton, a broad range of benthic organisms, certain species of fish at high tides, and feeding, bathing, and roosting habitat for a variety of shorebirds.	Five areas of eelgrass beds have been identified. There are two on the north shore of YBI, two on the south shore, and one on the north shore of the Oakland Touchdown area. Their functions are food source, nursery, spawning ground, and/or habitat for resident and migratory species of birds, fish, and invertebrates.

Table 4.9-5 Permanent Impacts To Special Aquatic Sites and Mitigation Measures (Continued)

	Wetlands	Sand Flats	Eelgrass Beds
Area Impacted by Replacement Alternative N-6	No permanent impact.	1.36 hectares (3.36 acres) at Oakland Touchdown as a result of construction of the westbound roadway and realignment of the Caltrans maintenance road and dredging for a barge access channel.	Permanent impacts to 0.21 hectare (0.52 acre) at the Oakland Touchdown area as a result of dredging and 0.01 hectare (0.03 acre) at YBI from construction of barge dock.
Area Impacted by Replacement Alternative N-2	No permanent impact.	1.36 hectares (3.36 acres) at Oakland Touchdown as a result of construction of the westbound roadway and realignment of the Caltrans maintenance road and dredging for a barge access channel.	Permanent impacts to 0.21 hectare (0.52 acre) at the Oakland Touchdown area as a result of dredging and 0.01 hectare (0.03 acre) at YBI from construction of barge dock.
Area Impacted by Replacement Alternative S-4	Permanent impacts to 0.05 hectare (0.12 acre) of non-tidal wetlands on the southern portion of the Oakland Touchdown area from construction.	0.01 hectare (0.03 acre) on south side of YBI as a result of dredging for a barge access channel.	0.15 hectare (0.37 acre) at YBI as a result of dredging and 0.01 hectare (0.03 acre) at YBI from construction of barge dock.
Area Impacted by Retrofit Existing Structure Alternative	No permanent impact.	No permanent impact.	No permanent impact.

Table 4.9-5 Permanent Impacts To Special Aquatic Sites and Mitigation Measures (Continued)

Mitigation	For Replacement Alternative S-4, off-site creation of non-tidal wetlands. For Replacement Alternatives N-6 and N-2 and the Retrofit Existing Structure Alternative, avoidance of habitat by marking the wetlands as Environmentally Sensitive Areas (ESAs). The ESAs would be marked in the field using fencing materials, buoys, or other appropriate, highly visible materials.	On-site restoration of portion of sand flats following construction and off-site creation of a tidal marsh ecosystem, including mudflats and tidal channels.	Harvesting eelgrass from within the barge access channel and replanting in adjacent beds as a pilot program; restoring portions of the barge access channel for colonization by eelgrass in area closest to the Oakland Touchdown; marking eelgrass beds outside barge access channel as ESAs; off-site creation of a tidal marsh ecosystem.

Source: Caltrans, 2000.

Replacement Alternatives N-2 and N-6 (Preferred)

Wetlands.

The wetlands located in the project area would not be affected by Replacement Alternatives N-2 and N-6. The wetlands would be identified as ESAs and marked in the field to prevent disturbance from construction activity.

Sand Flats.

Both northern replacement alternatives would affect intertidal sand flats. Replacement Alternatives N-2 and N-6 (Preferred) would permanently impact approximately 1.36 hectares (3.36 acres) of sand flats along the northern shore of the Oakland Touchdown area due to construction of the westbound roadway and realignment of the Caltrans maintenance road. Sand flats at this location provide habitat for shorebirds.

Eelgrass Beds.

Based on a 1999 eelgrass survey[9], Replacement Alternatives N-2 and N-6 would result in the loss of approximately 0.22 hectare (0.55 acre) of eelgrass beds due to dredging for barge access at the Oakland Touchdown area and for construction of a barge dock at YBI. These eelgrass beds are located on the northern shore of the Oakland Touchdown area and in Clipper Cove on YBI. As discussed in Section 3.9.4 — Wetlands and Waters of the United States, the eelgrass beds are comprised of scattered patches of eelgrass.

Replacement Alternative S-4

Wetlands.

Replacement Alternative S-4 would result in the loss of 0.05 hectare (0.12 acre) of non-tidal wetlands. The affected wetland areas are two non-tidal wetlands located on the southern portion of the Oakland Touchdown. The primary cause of the loss of wetland habitat is the construction of the eastbound roadway and construction staging.

Sand Flats.

Replacement Alternative S-4 would result in the loss of 0.01 hectare (0.03 acre) of sand flats located along the beach on the south side of YBI as a result of dredging for a barge access channel.

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[9] Caltrans completed a pre-construction survey for Replacement Alternative N-6. The physical survey was conducted in October 2000, with data generation and review being completed in January 2001. This survey has a limited purpose as opposed to prior surveys: it is a pre-construction survey intended to provide current data immediately prior to construction of a particular alternative to measure actual impacts to the greatest extent possible. Accordingly, this survey only covers the area impacted by Replacement Alternative N-6. Since the survey was not intended for the purposes of an alternatives analysis, it did not include areas impacted by other alternatives. As anticipated, the area occupied by the eelgrass beds at YBI and the Oakland Touchdown area has changed due to the natural annual variability in such beds. Since the eelgrass beds have grown between 1999 and 2000, the overall percentage of area impacted has not changed to any appreciable degree.

Eelgrass Beds.

Approximately 0.15 hectare (0.37 acre) of eelgrass located within Coast Guard Cove on YBI would be removed by dredging for Replacement Alternative S-4. In addition, construction of a barge dock would displace 0.01 hectare (0.03 acre) at YBI. No impacts are anticipated as a result of the new bridge structure because the bridge would be constructed high enough above the water surface to allow sunlight to penetrate the area from an angle to the north or south.

4.9.3 Special Status Species

Special status species include all plants and wildlife protected under the federal and state Endangered Species Acts, plants listed by the California Native Plant Society, avian species protected under the Migratory Bird Treaty Act, marine mammals protected under the Marine Mammal Protection Act, and fish species protected under the Magnuson-Stevens Act.

No-Build Alternative

Since the No-Build Alternative does not include any disturbance of the existing environment, there would be no impacts to special status plant and wildlife species.

Retrofit Existing Structure

The Retrofit Existing Structure Alternative would have no permanent impacts to special status plant and wildlife species..

Replacement Alternatives N-2, N-6 (Preferred), and S-4

The replacement alternatives would result in permanent impacts to marsh gumplant, double-crested cormorant, American peregrine falcon, western gulls, shorebirds, and Pacific herring. The replacement alternatives would not result in permanent impacts to the California least tern, California brown pelican, saltmarsh common yellowthroat, California clapper rail, Allen's hummingbird, white-tailed kite, American bittern, bank swallow, marine mammals, and protected fish species. A discussion of these species is provided below.

Marsh Gumplant and Alameda Song Sparrow.

As shown in Figures 3-17 and 3-18 in Appendix A, marsh gumplant occurs in four areas within the project area. Impacts to marsh gumplant can be seen on Figures 4-21 and 4-22 in Appendix A. Only one location of marsh gumplant (on the north side of the Oakland Touchdown) would be impacted by the northern replacement alternatives. Replacement Alternative S-4 would result in the removal of marsh gumplant, located to the south of the existing bridge on Port of Oakland property. While these would be impacts to the local marsh gumplant, impacts would not affect the long-term viability of the species because marsh gumplant is widely distributed throughout the San Francisco Bay tidal marsh ecosystem. Marsh gumplant is potential supporting habitat for the Alameda song sparrow. The Alameda song sparrow is a species of concern, but is not listed under either the Federal or State Endangered Species Act. Since the

viability of the marsh gumplant species would not be impacted, there would not be an impact to the Alameda song sparrow as a result of the East Span Project.

Double-Crested Cormorant.

Double-crested cormorants currently nest on the existing East Span. Construction of any replacement alternative would include the dismantling of the existing East Span bridge, which would result in the permanent removal of nesting sites for the double-crested cormorant.

American Peregrine Falcon.

A pair of American peregrine falcons nests on the existing East Span. Construction of a replacement alternative would include dismantling the existing East Span structure, which would result in the removal of the nesting site for the pair. Removal of the bridge could create a long-term impact to the American peregrine falcon. It is anticipated that the pair would nest on a replacement bridge, resulting in no long-term impact.

Shorebird Species.

Shorebirds include migratory birds which are protected under the Migratory Bird Treaty Act. Species of concern also included in this group are the common loon, long-billed curlew, and elegant tern. The replacement alternatives would not result in a direct impact to shorebird species; however, they would result in the removal of supporting roosting and feeding habitat. As discussed under Section 4.9.2, the northern replacement alternatives (Replacement Alternatives N-2 and N-6 [Preferred]) would result in the removal of sand flats. The loss of sand flats (1.36 hectares [3.36 acres]) along the northern portion of the Oakland Touchdown area would decrease the amount of available shorebird habitat. The loss in shorebird habitat is not anticipated to adversely impact shorebirds due to the relatively small area affected by the project.

Replacement Alternative S-4 would result in the removal of upland (0.21 hectare [0.51 acre]) known to be used by shorebirds. The upland area occurs on the south side of the Oakland Touchdown area and provides winter and high-tide roosting habitat for shorebirds.

Western Gull. Direct impacts to the western gull would occur if nests are present on column footings of the existing East Span prior to the dismantling of the structure.

California Least Tern. This species is not known to occur in the project area. However, new information has become available since concluding the endangered species consultation process with USFWS for the East Span Project; this information suggests the least tern may use former Oakland Army Base lands adjacent to the project area and portions of the southern shore of the Oakland Touchdown. These areas would not be permanently impacted by the East Span Project.

Black-crowned Night Heron, Allen's Hummingbird, White-tailed Kite, Bank Swallow, and Bewick's Wren. Permanent impacts to the night heron, Allen's hummingbird, white-tailed kite, bank swallow, and Bewick's wren are not anticipated because vegetation and trees removed during construction on YBI would be replaced as part of a revegetation plan implemented after construction is complete.

Saltmarsh Common Yellowthroat, California Clapper Rail, and American Bittern. Impacts to the saltmarsh common yellowthroat, California clapper rail, and American bittern are not anticipated because these species occur at the Emeryville Crescent, which is located outside of the project area.

California Brown Pelican. Impacts to the California brown pelican would not occur since this species does not nest in the project area.

Pacific Herring. Permanent impacts to Pacific herring as a result of Replacement Alternatives N-2, N-6, and S-4 would include loss of habitat such as eelgrass beds in the project area. Eelgrass beds would be permanently impacted due to dredging for barge access.

4.9.4 Other Natural Communities

Patches of natural communities such as coast live oak woodland, northern coastal scrub, and northern coastal saltmarsh occur within the project area. The replacement alternatives would result in permanent impacts only to the coast live oak woodland on YBI.

Coast Live Oak Woodland

Three patches of coast live oak woodland occur on slopes of YBI. Portions of two of these areas could be removed by the alteration of Macalla Road, which is required for all of the replacement alternatives, including the Preferred Alternative. Macalla Road would be realigned at a lower grade in an area located within the dripline of the tree canopy. This activity would damage the root zone of remaining trees and would result in a loss of six coast live oak trees. The coast live oak trees that would be affected range from 45 to 127 centimeters (18 to 50 inches) diameter-breast-height.

4.9.5 Consultation and Coordination

Consultation and coordination with federal, state, and regional agencies has occurred for the East Span Project. Pursuant to the NEPA/404 Integration Memorandum of Understanding (MOU), Caltrans and FHWA have consulted with U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (ACOE), and National Marine Fisheries Service (NMFS). Per the MOU, concurrence on the project's Conceptual Mitigation Plan for Special Aquatic Sites was requested and received from EPA, ACOE, and USFWS. Although not signatories to the NEPA/404 Integration MOU, Caltrans also coordinated with California Department of Fish and Game (CDFG), the Regional Water Quality Control Board, and BCDC as part of the NEPA/404 process. A summary of the NEPA/404 Integration MOU process and concurrence letters are included in Appendix F.

The ACOE has made a jurisdictional determination in the delineation of waters of the U.S., including wetlands subject to Section 404 of the Clean Water Act. The ACOE concurrence letter can be found in Appendix F.

Consultation with USFWS for species protected under Section 7 of the Endangered Species Act has been concluded. The American peregrine falcon was the only endangered species identified by the USFWS as having the potential to be impacted by the project. The peregrine falcon has been removed from the Federal Endangered Species Act list, but remains on the California Endangered Species Act (CESA) list and is a USFWS species of concern. (See USFWS correspondence dated August 31, 1999 in Appendix G.) In addition, Caltrans is consulting with the California Department of Fish and Game (CDFG) regarding potential impacts to Pacific herring and species regulated under the CESA, such as the American peregrine falcon. Caltrans will also continue to coordinate with CDFG regarding potential impacts to the double-crested cormorant, a California species of concern.

Consultation with NMFS for species protected under Section 7 of the Endangered Species Act has been concluded. Consistent with the mandates of the Magnuson-Stevens Fishery Management and Conservation Act and the Endangered Species Act Section 7 formal consultation process, FHWA and Caltrans consulted with NMFS regarding Essential Fish Habitat (EFH) and/or species protected under Section 7 of the ESA. As requested by NMFS, essential habitat supporting managed fish species was addressed in an Essential Fish Habitat Assessment (provided as an appendix to the June 1999 Biological Assessment that can be reviewed at Caltrans District 4 offices). The NMFS rendered a not likely to adversely affect biological opinion for the project on September 23, 1999 (see Correspondence in Appendix G). Coordination will continue with NMFS concerning the potential for impacts to fish species protected under the Endangered Species Act, including the Chinook salmon and steelhead, and to marine mammals protected under the Marine Mammal Protection Act.

4.9.6 Mitigation

Retrofit Existing Structure Alternative

The impacts of the Retrofit Existing Structure Alternative would occur only during construction. These impacts and their mitigation are discussed in Section 4.14.8 — Temporary Impacts, Natural Resources.

Replacement Alternatives N-2, N-6 (Preferred), and S-4

Special Aquatic Sites.

Impacts to special aquatic sites would be mitigated by on-site restoration of portions of the eelgrass and sand flat habitats and by off-site creation of a tidal marsh ecosystem. Mitigation concepts have been identified in the Conceptual Mitigation Plan for Special Aquatic Sites, which was prepared in coordination with the following agencies: USFWS, ACOE, EPA, BCDC, CDFG, and RWQCB (see Appendix N). The objective of the mitigation is to provide enhanced functions and values relative to the impacted

special aquatic sites. This approach is based on habitat evaluations and is consistent with mitigation for similar projects in the Bay Area.

Consultation with the state and federal agencies listed above will continue during the permitting process. Consultation will be concluded with the preparation and submittal of a Final Mitigation Plan for Special Aquatic Sites that identifies the specific habitat restoration methods, the criteria to be used for monitoring and evaluating the success of the mitigation effort, and a contingency plan if the mitigation fails. The Final Mitigation Plan will be based on the concepts developed in the Conceptual Mitigation Plan summarized below.

On-site restoration of eelgrass and sand flats would occur in the vicinity of the existing eelgrass beds, north of the Oakland Touchdown area. Restoration of the eelgrass beds and sand flats would include:

- Harvesting eelgrass from a portion of the barge access channel prior to dredging and replanting it in adjacent eelgrass beds as a pilot program;
- Restoring a portion of the barge access channel to its original bathymetry and replanting with eelgrass to facilitate re-colonization;
- Restoring portions of the sand flats to original grade; and
- Constructing rock slope protection to provide an upland transition zone.

The goal of the on-site mitigation is to restore existing functions and values to the special aquatic sites in the project area.

Off-site mitigation for eelgrass beds and sand flats would occur at an appropriate site, such as the Breuner property in the City of Richmond, that is approved by state and federal resource agencies. Creation of a tidal marsh ecosystem from existing uplands would include mudflats, tidal channels, and tidal marsh habitat. Restoration of any adjacent uplands and existing jurisdictional wetlands is also included in the mitigation concept. It is anticipated that creation and restoration of complementary habitat types proposed for off-site mitigation would result in greater wetland functions and values than those that currently exist in the project area. Specifically, the new tidal marsh would provide new habitat for the plant and wildlife populations that utilize the Central Bay, including migratory shorebirds and local fish and avian populations. Mitigation would be provided at a 3:1 ratio to compensation for the loss of special aquatic sites.

Special Status Species.

American Peregrine Falcon. The removal of the existing bridge would result in the loss of nesting area for the peregrine falcon. Mitigation, summarized below, would be similar to that outlined in the contract between Caltrans and the Santa Cruz Predatory Bird Research Group (SCPBRG) for the interim seismic retrofit project.

During dismantling of the bridge, a monitor from the SCPBRG would observe the birds' nesting activities. If the dismantling work disturbs nesting activities, the eggs and/or chicks would be collected, raised off-site, and eventually released off-site.

A June 24, 1997 letter from USFWS indicates that peregrine falcons would likely nest on the new bridge once construction activities are complete (see Appendix G). Since these birds of prey are known to use bridges and tall buildings as surrogate nest sites, no nest structures would be created on the new bridge for them. When peregrines recolonize the new bridge, monitoring and off-site release efforts by the SCPBRG would continue as they have for the existing bridge to avoid potential impacts during scheduled maintenance activities.

Double-crested cormorant. Nesting habitat would be constructed on the new bridge.

Shorebird Species. Permanent loss of shorebird roosting habitat as a result of construction of Replacement Alternative S-4 would be offset by enhancement or creation of upland refugia as part of the creation of a tidal marsh ecosystem.

Pacific Herring. Permanent loss of herring habitat (i.e., eelgrass) would be offset by on-site restoration and off-site creation of a tidal marsh ecosystem.

Natural Communities.

Coast Live Oak Woodland. All the replacement alternatives would require realignment of Macalla Road, which could result in removal of or disturbance to the root zone and loss of six trees. Post-construction surveys would be conducted to determine the number of trees actually removed or affected. Oaks would be replaced in accordance with the CCSF tree ordinance. The oak trees would be replaced at a ratio of 3:1 in the same area to create a visual setting comparable to the existing pre-construction condition. Due to the root structure of mature oak trees, it is not certain that Caltrans would be able to successfully plant replacement trees of the same size. As a result, the replacement trees may be smaller than those displaced. After replanting, monitoring and additional replanting would be performed as necessary to ensure success of the new trees. A conceptual mitigation plan, specifying goals, replacement ratio, success criteria, and monitoring would be determined in coordination with the San Francisco Public Works Department that has authority under the CCSF tree ordinance.

4.10 HISTORIC AND CULTURAL RESOURCES

This section reports the potential for East Span Project alternatives to affect archaeological and historic resources. The discussion in this section focuses on historic properties listed or potentially eligible for the National Register of Historic Places (NRHP) pursuant to the National Historic Preservation Act. For a discussion of historic resources in relation to Section 4(f) of the Department of Transportation Act, see Chapter 6.

The consideration of historic resources under Section 4(f) of the Department of Transportation Act differs from their consideration under Section 106 of the National Historic Preservation Act. Section 4(f) applies only to programs and projects undertaken by the U.S. Department of Transportation and only to publicly owned public parks, recreation areas, and wildlife refuges and to historic sites on or eligible for the NRHP. For protected historic sites, Section 4(f) is triggered by the "use" or occupancy of a historic site by a proposed project. In contrast, Section 106 applies to any federal agency and addresses direct and indirect "effects" of an action on historic properties. Section 106 evaluates "effects" on a historic site, while Section 4(f) protects historic sites from "use" by a project. Therefore, even though there may be an "adverse effect" under Section 106 because of the effects upon the site, the provisions of Section 4(f) are not triggered if the project would not result in an "actual use" (occupancy of land) or a "constructive use" (substantial impairment of the features or attributes which qualified the site for the NRHP). Section 106 of the National Historic Preservation Act requires agencies to take into account the effects of their projects on historic properties eligible or listed on the NRHP. Impacts to resources are assessed by application of the Criteria of Effect and Adverse Effect (36 CFR Part 800.9). An undertaking is considered to have an adverse effect on a historic property when the undertaking may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Pursuant to 36 CFR 800.9, an adverse effect on a historic property includes, but is not limited to: (1) physical destruction, damage, or alteration of all or part of the property; (2) isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's eligibility; (3) introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting; (4) neglect of a property resulting in its deterioration or destruction; and (5) transfer, lease, or sale of the property.

To satisfy the federal requirements for Section 106, Caltrans has prepared Finding of Effect Reports for NRHP listed and eligible resources within the project APE. The Section 106 Criteria of Effect and Adverse Effect were used to determine the effects of the proposed project on historic architectural resources and on archaeological resources. Caltrans and Federal Highway Administration (FHWA) have consulted with the SHPO concerning determination of effects (see letter in Appendix G from the SHPO dated September 10, 1998). Per Section 106 regulations, the SHPO concurred that the undertaking has an adverse effect on historic properties and did not comment or concur in what the specific effects to individual properties are.

Mitigation measures discussed in this section have been developed in consultation with the SHPO and Advisory Council on Historic Preservation (ACHP) (see Section 4.10.1 — Historic and Cultural Resources, Consultation for a summary of consultations). Views on mitigation measures have also been solicited from interested parties such as Native Americans, preservation organizations, and public agencies (e.g., the City of Oakland, the Navy, the USCG, and the CCSF).

In accordance with Section 106, measures to mitigate project effects on historic properties have been stipulated in an Memorandum of Agreement (MOA) executed among the FHWA, USCG, the SHPO, and the ACHP, with Caltrans as a concurring party (included in Appendix O). The Navy, local governments, and Native Americans were also invited to sign the MOA as concurring parties.

4.10.1 Consultation

A Finding of Effect for Archaeological Resources and a separate Finding of Effect for Historic Architectural Resources were submitted to the SHPO in July 1998. The SHPO responded concerning determination of effects in letters dated August 3 and September 10, 1998. Caltrans met with Oakland Landmarks Preservation Advisory Board on July 3, 1998, to discuss possible mitigation measures. Caltrans also met with Navy staff on August 25, 1998, to discuss project effects on the historic properties on YBI.

On December 10, 1998, Caltrans met with the City of Oakland and its Landmarks Preservation Advisory Board, the Oakland Heritage Alliance, and the Port of Oakland to discuss possible measures to mitigate project effects on historic properties. On February 1, 1999, representatives from ACHP, Caltrans, FHWA, the Navy, the USCG, CCSF, and the SHPO toured the project area and the historic properties. On February 2, 1999, Caltrans hosted two meetings with historic preservation organizations, ACHP, SHPO, Navy, USCG, FHWA, and city governments. The first meeting included discussion of the replacement alternatives and effects on Navy and USCG facilities of YBI and proposed measures to mitigate project effects on historic properties. The second meeting continued the discussion of measures to mitigate for the loss of the East Span under the replacement alternatives. In October 1999, an Addendum Finding of Adverse Effect and Consideration of Proposed Mitigation Measures (which included a draft MOA) were transmitted to the SHPO, ACHP, Navy, USCG, the CCSF, City of Oakland, and Bay Area historic preservation groups. Comments were received from the USCG, Navy, SHPO, and ACHP. A meeting with the Navy was held on March 1, 2000, to discuss its comments on the MOA. The MOA was revised based on consideration of comments received. The MOA was executed in May 2000, stipulating mitigation measures to be followed on this project (see Appendix O for a copy of the MOA).

4.10.2 Impacts to Archaeological Resources

Replacement Alternatives N-6 and S-4, including temporary detours, would have an impact on CA-SFr-04/H. Replacement Alternative N-2 would have no impact on the site (see Table 4.10-1).

Pursuant to the project MOA, Caltrans would prepare a treatment plan for pre-construction archaeological data recovery. It would be submitted to all parties to the MOA for review and comment. Interested Native Americans would also be invited to participate in development of the treatment plan.

Table 4.10-1 Summary of Effects to CA-SFr-04/H by Alternative

Alternative	Description of Impact to Prehistoric Midden Component of CA-SFr-04/H
No-Build	No work within site boundaries. No impact.
Retrofit Existing Structure	Excavation to strengthen Column YB3 would disturb site.
N-2	No excavation within site boundaries.
Temporary Detours	No impact.
N-6 (Preferred)	Columns for both east- and westbound permanent structures would disturb site.
Temporary Detours	One column for the westbound temporary detour would disturb site.
S-4	Permanent structures would not affect site.
Temporary Detours	Four columns for the westbound temporary detour would disturb site.

Source: Caltrans, San Francisco-Oakland Bay Bridge East Span Seismic Safety Project Finding of Effect for Archaeological Resources Located in the City and County of San Francisco and the City of Oakland, Alameda County, California, July 1998.

A Native American monitor would be present during all archaeological field investigations. If human remains are located, either Native American or non-Native American, Caltrans would ensure that treatment of the remains would comply with all applicable state and federal laws and regulations, including the Native American Graves Protection and Repatriation Act of 1990 (P.L. 101-601, 25 U.S.C. 3001-3013). California Public Resources Code Sections 5097.98 and 5097.99 require protection of Native American remains which might be discovered and outline procedures for handling any burials found.

In all cases where human remains are discovered, the County Coroner would be notified and, in the case of Native American remains, the state Native American Heritage Commission (NAHC) would be notified. Consultation with a Most Likely Descendant designated by the NAHC would be conducted.

If human remains are discovered during construction, all work would cease in the immediate vicinity of the discovery until the appropriate treatment has been completed.

Mitigation for Archaeological Resources: A Treatment Plan would be prepared by Caltrans for pre-construction archaeological investigations. See Stipulation VII of the MOA in Appendix O for more details.

The Treatment Plan would include a data recovery plan for the prehistoric component of CA-SFr-04/H, as well as guidelines for evaluation and data recovery of any other archaeological deposit within the area of the undertaking. The Treatment Plan would address treatment of unanticipated discoveries of any other archaeological deposits, such as historic archaeological remains, within the project construction area.

The Treatment Plan would be consistent with the Secretary of the Interior's Standards and Guidelines for Archaeological Documentation and would take into account the ACHP's publication, Treatment of Archaeological Properties: A Handbook, and SHPO guidelines.

Interested Native Americans will be invited to participate in the development of the Treatment Plan. In addition, Caltrans would also submit the Treatment Plan to all parties to the MOA, including interested Native Americans, for review and comment. Comments received within 30 days would be taken into account.

A Native American monitor would be present during archaeological field investigations. If any buried cultural materials are encountered during construction, work would cease in the vicinity of the discovery, and a Caltrans archaeologist would be contacted to evaluate the finds.

Caltrans would develop public interpretive materials covering historical and archaeological resources within the project area and would disseminate these materials to both the public at large and educational institutions. Interpretive materials may include, but are not limited to: a mobile exhibit on the archaeology and history of Yerba Buena Island (YBI), curriculum materials, a web site, and other public presentations.

4.10.3 Impacts to Historic Architectural Resources

Build alternatives have been determined to affect historical architectural resources within the project limits. Potential impacts are presented in this section. Under the Department of Transportation Act of 1966, all build alternatives result in Section 4(f) use of historic resources. See Chapter 6 — Section 4(f) Evaluation.

No-Build Alternative

The No-Build Alternative would not affect any of the historic architectural resources within the project APE.

Retrofit Existing Structure Alternative

Impacts to historic architectural properties from the Retrofit Existing Structure Alternative would result from modifying the existing SFOBB East Span and change in

views to the Bay from Quarters 1. These changes would result in an impact. Impacts are summarized below.

San Francisco-Oakland Bay Bridge (SFOBB). The Retrofit Existing Structure Alternative would add new piles and pile caps at many columns, construct two new columns at the main span of the cantilever truss, and encase several steel columns in concrete. These changes to the existing structure would substantially alter the East Span portion of this historic structure, resulting in a loss of integrity of design and materials.

There would be no impact to the Caltrans Garage and Caltrans Electrical Substation on YBI, the Caltrans Electrical Substation at the Oakland Touchdown area, and the Key Pier Substation, which are associated with the SFOBB and contributors to the bridge's nomination to the NRHP. The structures would be retained under the retrofit alternative.

Senior Officers' Quarters Historic District (includes Quarters 1 to 7 and Buildings 83, 205, and 230). The retrofit of Columns YB2 through YB4 on YBI would result in encasement of the existing steel columns in concrete. The resulting walls would substantially impair the view from Quarters 1 across the eastern portion of San Francisco Bay. This would constitute a visual intrusion that would diminish an important aspect of the building's setting.

Quarters 1. Retrofit of Columns YB2 through YB4 on YBI, as described above, would result in an impact on Quarters 1.

Quarters 8. No work related to the retrofit alternative would cause impacts to Quarters 8. This residence is located downslope from the existing structure within the USCG base. Bay views from the structure would not be modified by retrofit activities.

Quarters 9. No work related to the retrofit alternative would result in impacts to Quarters 9. This structure is located on Treasure Island Road facing southeast. Views from the structure to the Bay would not be affected, and access to the building would not be modified.

Quarters 10. No impacts would result to Quarters 10 from the Retrofit Existing Structure Alternative. This residence is located at an elevation equal to the bridge decks and is screened from view of the bridge by surrounding oak woodland vegetation.

Building 267. This building is a garage adjacent to Quarters 10 and is screened from view of the SFOBB by surrounding vegetation. No impact to this building would result from the retrofit alternative.

Building 262. The retrofit alternative would have no impact on Building 262. Work to strengthen existing columns on YBI and immediately offshore would not have an effect on the materials or craftsmanship which make the building significant or diminish the understanding of the relationship of the building to early military occupation on YBI.

The retrofitted structure would cause no permanent change in the noise levels from existing conditions.

Replacement Alternatives

Historic architectural resources on YBI and at the Oakland Touchdown area would be affected by some of the replacement alternatives. All replacement alternatives would affect the SFOBB. With the exception of Building 262, properties eligible for historic architectural significance and for association with military history would not be affected by the replacement alternatives; these characteristics which make the properties significant would remain intact after project implementation.

San Francisco-Oakland Bay Bridge (SFOBB). All of the replacement alternatives would require removal of the existing East Span. Dismantling of this historic structure would result in the removal of a structure eligible for listing on the NRHP.

The impacts to four buildings which are associated with the SFOBB and are contributors to the bridge's nomination to the NRHP are discussed below:

Caltrans Garage (Yerba Buena Island). This contributing structure to the NRHP- eligible SFOBB would be removed under all replacement alternatives. This would remove a contributory structure to the NRHP- eligible SFOBB.

Caltrans Electrical Substation (Yerba Buena Island). This contributing structure to the NRHP- eligible SFOBB would be removed under all replacement alternatives.

Caltrans Electrical Substation (Oakland Touchdown Area). The electrical substation at the Oakland Touchdown area adjacent to the SFOBB would not be altered or removed to construct the replacement alternatives. Construction activities conducted adjacent to the substation are not expected to result in damage to the structure.

Key Pier Substation. The Key Pier Substation would not be altered or removed as a result of dismantling of the SFOBB. As a result, the DEIS stated that the Key Pier Substation will not be affected by any of the project alternatives. However, part of the building's significance is as a contributing component of the Bay Bridge. Although the bridge would be dismantled under any of the replacement alternatives, the building would remain individually eligible for NRHP listing for its association with the Key System Railway, but its historic association with the SFOBB would be lost. All replacement alternatives would have an impact on the Key Pier Substation by removing the SFOBB. Also, construction work in the vicinity of the substation could result in inadvertent damage to the structure.

Senior Officers' Quarters Historic District (includes Quarters 1 to 7 and Buildings 83, 205, and 230). Replacement Alternatives N-2 and N-6 would each place the westbound structure over the southeast corner of the historic district. Replacement Alternative N-2 extends approximately 10 meters (33 feet) north of the existing bridge, while Replacement Alternative N-6 extends approximately 12 meters (40 feet) north of the existing bridge, over the historic district. No contributing buildings or landscape features would be altered because no part of Replacement Alternatives N-2 or N-6 would touch any part of the district. No historic characteristics of the district would be diminished. Views from Quarters 1 would be slightly modified by placing concrete columns within view and removing the existing steel column from view.

Replacement Alternative S-4 would shift the new bridge slightly farther away from the historic district than the existing bridge. It would have no impact on the historic district.

Temporary detours (see Figures 2-16.2, 2.17.2 and 2-18 in Appendix A) required for the replacement alternatives would be in place for up to 4 years. Temporary detours would be placed over the historic district. These temporary detours would require construction of numerous column footings within the district. The affected areas would be restored to their prior condition at the completion of the project.

Quarters 1. See Senior Officers' Historic District, above. Replacement Alternatives N-2 and N-6 would not have an effect on Quarters 1. Replacement Alternative S-4 would not have an impact on Quarters 1.

Temporary detours required for the replacement alternatives would be operational for approximately 2 years. The period from the beginning of construction to the end of their operational use would be approximately 4 years. The detours may be removed as soon as they are no longer needed to carry traffic or they may be removed as one of the last steps of bridge construction on YBI, because the contractor may use them as platforms from which to construct other portions of the bridge. Temporary detours would be placed adjacent to the south side of the residence, approximately 2 meters (7 feet) to the south for Replacement Alternatives N-2 and N-6 (Preferred) and 5 meters (16 feet) for Replacement Alternative S-4, with numerous column footings within the viewshed looking out from Quarters 1. Any affected areas within the footprint of the Quarters 1 National Register-described boundaries would be restored to prior condition at the completion of the project.

Quarters 8. Quarters 8 would not be affected by any of the replacement alternatives.

Temporary detours under all replacement alternatives would avoid Quarters 8. The detour structures would be temporary and the affected areas would be restored to their prior condition at the completion of the project.

Quarters 9. Quarters 9 would not be affected by any of the replacement alternatives.

No temporary detours under any of the replacement alternatives would affect Quarters 9.

Quarters 10. Quarters 10 would not be affected by any of the replacement alternatives.

No temporary detours under any of the replacement alternatives would affect Quarters 10. A temporary retaining wall would be constructed on Macalla Road adjacent to Quarters 10. Construction activities in the vicinity of Quarters 10 could result in inadvertent damage.

Building 267. Building 267, a garage, is a contributing structure to Quarters 10. No impact would result to Building 267 due to temporary detours for the replacement alternatives. Construction would require closure of the driveway to the building for approximately one day while the driveway is regraded to align with the new Macalla Road configuration.

Building 262. Replacement Alternatives N-2 and N-6 would have an impact on Building 262; replacement structures would pass above the building at approximately 53 meters (175 feet) above the ground in this area, and the two side-by-side decks would cover the entire length of the building. The close proximity of the new structures would introduce "visual, audible, or atmospheric elements that are out of character with the property." (See Figure 4-24 in Appendix A.) Construction activities in the vicinity and overhead could result in inadvertent damage.

Mitigation for Buildings and Structures: The measures listed below represent mitigation measures stipulated in the MOA (see Appendix O). The MOA is alternative neutral. While stipulations are identified for all alternatives, only those identified for the alternative selected in the Record of Decision will be carried out. The mitigation program for the East Span Project is intended to provide a publicly available record of information for the East Span and other historic properties that would be affected as a result of the proposed project.

Mitigation of Effects on the San Francisco-Oakland Bay Bridge:

- Salvage: Caltrans would offer selected components of the bridge to the East Bay Regional Park District (EBRPD) or other owner of the proposed Gateway Park (south of the new bridge, between the toll plaza and the shoreline in Oakland), for display or other use in the park. Caltrans will also provide the Oakland Museum of California, the Western Railway Museum in Rio Vista, Solano County, and any other interested parties an opportunity to select components of the bridge for curation, display, or other appropriate use.

- Permanent interpretive exhibits: Caltrans would consult with the EBRPD or other owner of the proposed Gateway Park about their interest in having interpretive exhibits incorporated into the design of the park which describe the Bay Bridge as originally constructed. If consultation does not result in agreement between Caltrans and the park owner, Caltrans would seek an alternative East Bay location.

Caltrans would also consult with the City and County of San Francisco (CCSF) about their interest in having similar interpretive exhibits on YBI.

- Museum exhibit: Caltrans would consult with the Oakland Museum of California, the Academy of Sciences in San Francisco, and/or other Bay Area museums about their interest in presenting an exhibit relating to the history and engineering of major bridges of San Francisco Bay.

- At the conclusion of the museum exhibit, Caltrans would select historic items and interpretive materials from the exhibit to be offered to local governments, historical societies, and other interested parties in the Bay Area for permanent curation and public display.

- Oral history: Caltrans would produce oral history documentation related to the construction and operation of the Bay Bridge, which include audio tapes and transcripts and may also include video tapes.

- Documentary videos: Caltrans would provide one or more of the existing documentary videos and current materials about construction of the Bay Bridge to the libraries of Oakland, San Francisco, Emeryville, and Berkeley, as well as the California Historical Society. In addition to the videos, Caltrans would produce curriculum materials and provide them to the public school systems of Oakland, San Francisco, Emeryville, Berkeley, and other school districts upon request.

Mitigation of Effects to the Senior Officers' Quarters Historic District, Quarters 8, Quarters 10, Building 267, and Building 262:

- Protective measures: Caltrans, in consultation with the Navy and USCG, will develop appropriate measures to protect the Senior Officers' Quarters Historic District, Quarters 8, Quarters 10, Building 267, and Building 262 from damage during the undertaking, including vibration monitoring at Building 262 during pile driving in the vicinity of the building and surrounding the building with fencing.

- Repair of inadvertent damage to buildings: Caltrans would ensure that any damage to the Senior Officers' Quarters Historic District, Quarters 8, Quarters 10, Building 267, and/or Building 262 resulting from the undertaking would be repaired in accordance with the Secretary of the Interior's Standards for Rehabilitation.

- Historic structure report: Caltrans would prepare a historic structure report for Building 262 to promote the reuse of this building.

- Restoration of grounds: Caltrans would ensure that the grounds of the Senior Officers' Quarters Historic District, Quarters 8, and Quarters 10 are restored to their condition prior to the start of the undertaking after completion of the bridge project and removal of all temporary structures. Restoration of the grounds would include, but would not necessarily be limited to: new sod in grass areas, replacement of shrubbery and trees; regrading and revegetation of disturbed slopes, including the

planting of mature trees; repair or replacement of damaged paving, sidewalks, and curbs.

- Screen planting: In consultation with the property owner, Caltrans would develop and implement a planting plan to screen the concrete-encased Column YB3 from Quarters 1. FHWA would ensure that final design for any replacement structure minimizes visual and physical impacts to the Senior Officers' Historic District and other historic properties.

Mitigation of Effects to the Caltrans Electrical Substation and Key Pier Substation at the Oakland Touchdown:

- Caltrans would minimize potential for damage during construction to the Caltrans Electrical Substation and Key Pier Substation on the Oakland Touchdown by designating these structures as environmentally sensitive areas (ESAs). The ESAs would be designated on contract plans and in specifications as being off limits to construction activities.

4.11 SCIENTIFIC RESOURCES

Potential exists for paleontologic resources to be disturbed during in-Bay construction to retrofit existing footings and columns for the Retrofit Existing Structure Alternative and construct new footings and columns for the replacement alternatives.

Mitigation: Should any paleontologic resources be discovered during in-Bay construction, Caltrans would ensure that provisions of the California Public Resources Code Section 5097.6 are implemented using their "Interim Guidance for the Identification, Assessment, and Treatment of Paleontological Resources." Any discovered remains would be evaluated by a professional paleontologist and deposited at an appropriate scientific repository such as the Paleontological Museum of the University of California, Berkeley.

4.12 UTILITIES RELOCATION

The backup water supply line on the existing East Span would be retained under the No-Build and Retrofit Existing Structure Alternatives but would be relocated, potentially to the new structures, under the replacement alternatives. In 1944, the Navy entered into an agreement with the State of California which stipulates that the Navy would pay for relocating the water line in the event that it is moved.

The EBMUD outfall, which extends into San Francisco Bay for a distance of approximately 1,600 meters (1 mile), is located to the south of the existing East Span. It is a zero-load facility that cannot support any weight and must be protected or spanned to prevent damage. For Replacement Alternatives N-2 and N-6, a temporary span over the land-based portion of the EBMUD sewer outfall may be necessary for the construction period and the contractor would coordinate it with EBMUD. Replacement Alternative S-4, which crosses the buried outfall line on the Oakland Touchdown, would require that a special design be used to sufficiently span the outfall facility to prevent damage during construction. Caltrans and the contractor will coordinate with EBMUD, if a southern alternative is chosen, to prevent damage to the pipe. Replacement Alternative S-4 would also interfere with access to EBMUD's dechlorination facility due to insufficient vertical clearance between the bridge and the existing service road. It would require relocation of the service road or the dechlorination facility. Caltrans would work with EBMUD to relocate the service road and/or the dechlorination facility to maintain EBMUD's operations during relocation. Caltrans would obtain necessary permits/permit amendments, fund relocation costs, and implement any necessary mitigation.

Electrical power to the islands is provided by PG&E via a Navy-owned pole line along the south side of the approach to the bridge that transitions near the incline to a 34.5 kilovolt submarine cable.

The contractor would have substantial disincentives for disruption of the primary power supply. If an occurrence should unavoidably require dependence on the existing backup power source and if the Navy/CCSF documents the additional cost of using the backup line, Caltrans or the contractor would pay the difference in cost. In addition, if the Navy/CCSF provides documentation for monetary loss in the event that the back-up line also fails, Caltrans or the contractor would also provide reimbursement for the documented losses.

Utilities located on the existing East Span would be maintained under the No-Build and Retrofit Existing Structure Alternatives, but would be relocated under the replacement alternatives. Timing of utility relocations would be set to avoid interruption of service when portions of the existing span would be removed or when it is not possible to maintain them on the existing structure. The Navy/CCSF and USCG will have the opportunity to review and comment on the proposed utilities plans and specifications.

Natural gas is provided to the islands by a 254-millimeter (10-inch) diameter high-pressure submarine gas main from Oakland. Submarine utilities would be avoided to the greatest extent possible. In addition, bridge footings would be located in such a

manner as to avoid impacts to underwater utilities. Contract specifications would include a provision for the contractor to protect submarine utilities during construction. Coordination with utility providers has been initiated to verify locations of submarine utilities and to identify potential conflicts. Coordination with utility providers would continue through the final design process and construction period. If utilities cannot be avoided, they would be relocated or protected in place (e.g., placing a concrete slab over the utility or encasing it in a conduit). Caltrans or the contractor would also repair inadvertent damage resulting from construction activities.

As a result of the federal land transfer (see Section 3.1.1 — Existing Land Uses in the Project Vicinity for more information), Caltrans now owns land in fee on YBI. Caltrans is coordinating with the Navy, CCSF, and the USCG regarding their ability to access utilities within Caltrans' right-of-way.

4.13 ENERGY

4.13.1 Analysis Methodology

This section addresses the impact of the San Francisco Oakland Bay Bridge (SFOBB) build alternatives on indirect energy consumption (i.e., consumed during construction activities). NEPA requires a discussion of energy requirements and conservation measures with particular emphasis on avoiding or reducing inefficient, wasteful, and unnecessary consumption of energy (40 CFR 1502.16(e)). Energy generation and distribution issues in California in late 2000 and early 2001 have created renewed awareness of electrical energy supply, demand, and distribution.

A long-term energy impact assessment was not prepared for the East Span Project because current guidance for preparing energy analyses only requires a comparison among project alternatives of the barrels of oil consumed from long-term use of the facility. The East Span Project build alternatives do not add traffic capacity compared to the No-Build Alternative. Therefore, long-term oil consumption should be about the same for all project alternatives. There is the potential for the replacement alternatives, which include inside and outside shoulders, to improve traffic operations by minimizing the traffic congestion effects of accidents and breakdowns. The energy consumption benefits of the improved traffic operations of the replacement alternatives would be minimal in comparison to the long-term energy consumption of vehicles using the bridge. It is not possible to measure this slight potential energy reduction due to improved traffic operations of adding shoulders because of the lack of predictability of accidents and breakdowns.

The amount of electrical energy consumption for construction and ongoing electrical needs for this project (roadway lighting, substations, etc.) would be infinitesimal when compared to the energy expended by vehicles using the bridge. There would be no electrical energy savings associated with the project. Electrical usage would remain the same as existing conditions for the No-Build and Retrofit Existing Structure Alternatives since the existing electrical facilities would remain the same. For the replacement alternatives, any savings experienced by the use of new technology would be offset by the increases in electrical usage because a replacement bridge would be longer than the existing bridge and would require additional electrical fixtures.

Indirect energy impacts involve the one-time, non-recoverable energy costs associated with construction of roadways and transportation-related facilities such as bridges. Facility-related energy accounts for energy consumed during the following activities:

- Production of construction materials; and
- Construction of the various build alternatives, including pavement and structures.

Construction of the build alternatives for the SFOBB would be a large-scale effort with many issues, techniques, and methods. Particular issues associated with this project include work to be conducted within the water, access to materials (either by land or water), dismantling activities, dredging activities, pile driving, and others. For a discussion of the construction scenario, see Chapter 2.

The indirect energy analysis was conducted using the Input-Output Method, a standard Caltrans method outlined in the Caltrans 1983 Energy and Transportation Systems Manual. This method was used to convert the 2002 construction dollars, identified in Table 2.4-1 of this document, into energy consumption.[10] (See Section 2.4.2 — Costs for more information.) Although the cost of fuels varies from region to region, this is an appropriate method for analyzing construction energy when limited information is available.

Energy is measured in British thermal units (Btus)[11]. For this analysis the Btus were converted to the equivalent barrels of crude oil for comparison of alternatives. For purposes of comparison, 5.3 million barrels is approximately equivalent to the total daily amount of motor gasoline consumed in the United States or total gasoline sales in one week in California.

4.13.2 Impacts

The indirect energy consumption for construction-related activities for each alternative is summarized in Table 4.13-1. Over 90 percent of the energy expended on each of the build alternatives would be the result of structure and roadway construction. Other elements, such as bicycle/pedestrian paths and lighting would account for a very small portion of the total indirect energy consumption.

No-Build Alternative

There would be no construction costs associated with the No-Build Alternative and, therefore, no expenditure of indirect energy.

Retrofit Existing Structure Alternative

Based on 2002 construction costs of $900 million dollars, the Retrofit Existing Structure Alternative would consume approximately 20,091 billion Btus or 3.5 million barrels of oil during construction.

Replacement Alternative N-2

Based on 2002 construction costs of $1,350 million dollars, the skyway design variation would consume approximately 30,129 billion Btus or 5.2 million barrels of oil during construction. This design variation would not include lighting; therefore, no indirect energy would be expended for this element.

[10] A Btu/$ conversion of 70,100 Btu/$ is based on 1977 construction costs. In order to use the factor of 70,100 Btu/1977 Construction Dollar, a factor of 3.14 was used to convert 2002 construction dollars from 1977 construction dollars. A conversion factor of 70,100 Btu/1977 Construction Dollar is based on the construction of an interchange. The actual amount of energy consumed may be larger, but no database of information for a facility of this type was identified. This estimate provides for a comparison of alternatives.

[11] One Btu is the quantity of energy necessary to raise one pound of water one degree Fahrenheit.

Table 4.13-1 Indirect Energy Analysis

Description	Alternatives									
	Retrofit Existing	Skyway			Cable-stayed Main Span Design Option			Self-anchored Suspension Bridge		
		N-2	N-6	S-4	N-2	N-6	S-4	N-2	N-6 (Preferred)	S-4
2002 Construction Costs (millions) [a]	$900	$1,350	$1,350	$1,350	$1,550	$1,550	$1,600	$1,600	$1,650	$1,600
1977 Equivalent Construction Costs (millions) [b]	$287	$430	$430	$430	$494	$494	$510	$510	$526	$510
TOTAL BTUS CONSUMED (billions)[c]	**20,091**	**30,129**	**30,129**	**30,129**	**34,601**	**34,601**	**35,716**	**35,716**	**36,838**	**35,716**
TOTAL BARRELS OF OIL CONSUMED[d]	3,464,000	5,195,000	5,195,000	5,195,000	5,966,000	5,966,000	6,158,000	6,158,000	6,351,000	6,158,000

Notes:

[a] Construction costs are derived from Table 2.4-1 of this document. The cost information in this table represents the estimated cost of the various alternatives based on information available in 1998. They do represent the current costs of the alternatives, which would be greater, but still have the same relative relationship. See Section 2.4.2 — Costs for more information.

[b] In order to use the factor of 70,100 Btus/1977 Construction Dollar, a dividing factor of 3.14 was used to convert 2002 construction dollars to 1977 construction dollars.

[c] Construction dollars converted to Btus based on construction energy factor of 70,100 Btus/1977 construction dollar (Caltrans 1983).

[d] Based on a conversion factor of 5.8 million Btus/Barrel of crude oil.

Source: Caltrans, September 2000.

The cable-stayed main span design variation would have a 2002 construction cost of $1,550 million dollars. The indirect energy consumption for this alternative would be approximately 34,601 billion Btus or 6.0 million barrels of oil. This alternative would include all facility elements described above.

The self-anchored suspension bridge design variation would have a 2002 construction cost of $1,600 million dollars. Construction energy consumption would be approximately 35,716 billion Btus or 6.2 million barrels of oil. This alternative would include all facility elements described above.

Replacement Alternative N-6 (Preferred)

With a 2002 construction cost of $1,350 million dollars, the skyway design variation would consume approximately 30,129 billion Btus or 5.2 million barrels of oil during construction. This alternative would consume the same energy as Replacement Alternative N-2.

The cable-stayed main span design variation would have a 2002 construction cost of $1,550 million dollars. The indirect energy consumption for this alternative would be approximately 34,601 billion Btus or 6.0 million barrels of oil. This alternative would consume the same energy as Replacement Alternative N-2.

The self-anchored suspension bridge design variation (Preferred design variation) would have a 2002 construction cost of $1,650 million dollars. Construction energy consumption would be approximately 36,838 billion Btus or 6.4 million barrels of oil. This alternative would consume slightly more energy, compared to Replacement Alternative N-2. This alternative would have the highest indirect energy consumption of any of the alternatives.

Replacement Alternative S-4

Based on a 2002 construction cost of $1,350 million dollars, the skyway design variation would consume approximately 30,129 billion Btus or 5.2 million barrels of oil to construct. This alternative would consume the same energy as Replacement Alternatives N-2 and N-6.

The cable-stayed main span design variation would have a 2002 construction cost of $1,600 million dollars. The indirect energy consumption for this alternative would be approximately 35,716 billion Btus or 6.2 million barrels of oil. This alternative would consume slightly more energy, compared to either Replacement Alternatives N-2 or N-6.

The self-anchored suspension bridge design variation would have a 2002 construction cost of $1,600 million dollars. Construction energy consumption would be approximately 35,716 billion Btus or 6.2 million barrels of oil. This alternative would consume the same amount of energy as Replacement Alternative N-2 and slightly less than Replacement Alternative N-6.

The following design considerations would reduce the amount of indirect energy consumed, but are not anticipated to have a significant overall reduction. These

design considerations applied during the planning and construction phases would reduce the amount of indirect energy consumption. Therefore, design and construction of build alternatives would:

- Maximize the use of recycled materials;
- Maximize the use of energy-saving technologies;
- Maintain the performance of construction equipment; and
- Recycle materials used in construction as much as possible and within design specifications.

4.14 TEMPORARY IMPACTS DURING CONSTRUCTION ACTIVITIES

This section describes potential temporary impacts of project alternatives that may occur during construction. Because the No-Build Alternative would not involve any project-related construction, discussions are focused on the build alternatives. Although construction techniques would vary between the retrofit and replacement alternatives, they would have similar construction issues with respect to scale of work and laydown areas on Yerba Buena Island (YBI) and the Oakland Touchdown. As a result, construction impacts on land would generally be similar for all build alternatives. In general, the potential for disruptive construction impacts would correspond to the type and location of activities proposed in each construction stage and to the duration of the overall construction process associated with each alternative.

The Retrofit Existing Structure Alternative is estimated to require about 6 years to construct. For the replacement alternatives, the estimated time required for bridge completion is 5 years, which includes construction of the over-water sections (main span and skyway) and construction of the transition and temporary detours on YBI. It is estimated that the entire project would be completed in 6 to 7 years, which includes dismantling the existing East Span.

4.14.1 Community Impacts

Potential construction period impacts to residents, government facilities on YBI, and businesses at the Oakland Touchdown area are addressed in the following section.

Neighborhoods and Businesses

During construction of the Retrofit Existing Structure Alternative, there would be no ramp closures, roadway modifications, or temporary detours on YBI and the Oakland Touchdown area. However, during construction there could be some delays for motorists as local streets are used for transport of workers, equipment, and materials.

For the replacement alternatives, ramp closures, roadway modifications, and temporary detours on YBI would affect motorists. One road on YBI (Southgate Road) would be closed during construction for a period of approximately 2 years, while other roadways could be subject to periodic lane closures. (See Section 4.14.2 — Transportation Impacts During Construction). Further delays would occur as construction trucks and equipment use local streets.

No matter which alternative is constructed, current uses of Quarters 1-7 would not be desirable during construction due to the following:

- Construction noise (especially nighttime noise) ;
- Lighting for night construction;

- Visual impact of temporary detours for the replacement alternatives and construction activity; and

- The adjoining Parade Grounds are part of the land transferred to Caltrans as a construction easement and would not be available for parking during bridge construction.

Building 262, located at the eastern end of YBI, would be accessible, but would not be usable during construction due to high levels of construction activity and limited access through the construction zone. Building 262 is planned for renovation in Phase 3 of Treasure Island Development Authority (TIDA) plans, expected to occur between 2007 and 2011. However, there are no immediate plans for use of this vacant building. Following construction, the availability of Building 262 would be restored. However, access to the building would be modified. A portion of the access road to Building 262 would be modified to avoid the footings of the eastbound temporary detour and to avoid columns of a replacement bridge. While the eastbound temporary detour is in place, the road would be temporarily realigned approximately 50 meters (164 feet) south of the existing road. For each replacement alternative, a portion of the access road leading to Building 262 would be permanently realigned approximately 15 meters (49 feet) to the south and would become a two-lane roadway that would conform to the existing single-lane dirt road approximately 115 meters (377 feet) from the eastern end of YBI. The roadway configuration would vary slightly for each replacement alternative to avoid different column locations.

Mitigation:

During the construction period, Caltrans would reimburse the City and County of San Francisco (CCSF) for documented loss of rental revenues for Quarters 1-7. As stated in Section 4.10.2 — Impacts to Historic Architectural Resources and the Memorandum of Agreement in Appendix O, a pre- and post-construction survey of Quarters 1-7 and Building 262 would be conducted and construction-related damage to the buildings repaired as necessary. Protective measures would be developed in consultation with property owners.

Construction-period Safety and Security

Heavy vehicle movements, possible hazardous wastes excavation and transport, and construction site activity could create potential safety concerns for construction workers and members of the public on YBI and at the Oakland Touchdown.

Mitigation:

Caltrans would require that best construction management practices be in place to ensure the safety of construction workers, local employees, and residents during construction of the build alternatives. The contractor would implement fencing, signage, and lighting of construction and staging areas; recognized safety practices for the utilization of heavy equipment; the movement of construction materials; and the handling of hazardous materials and wastes in such a way so as to avoid accidents. During construction, Caltrans would require that the project contractor be responsible for job-site

safety and security and prepare a Health and Safety Plan. Temporary detours, lane blockages, and truck entrance locations would be well signed.

Caltrans would apprise police, fire, the Coast Guard, and other emergency response agencies of construction activities, temporary detours, and road blockages throughout the construction process.

The public would be alerted by Caltrans about temporary detours, lane blockages, and truck entrances. These locations would be well signed.

Construction Employment

Economic activity generated by the proposed build alternatives is anticipated to benefit the Bay Area region and would also follow the labor and material markets for highway bridge construction. Refer to Section 4.1.1 — Social and Economic Impacts for a complete discussion of employment-generation impacts of the project.

4.14.2 Transportation Impacts During Construction

Construction activities proposed under all build alternatives would temporarily affect transportation facilities within the project area as described below.

Once the alternative for the East Span Project is selected in the Record of Decision (ROD), Caltrans will prepare a Traffic Management Plan (TMP) with input from local public agencies. It is anticipated there would be no traffic disruptions requiring additional transit services to alleviate short-term impacts. The TMP would address in detail construction-related traffic issues, such as roadway closures, lane closures, access, impacts of "rubbernecking," and provisions for minimizing traffic disruptions. The TMP would include a public awareness campaign involving measures that allow communication of project information to residents, employers, commuters, the media, and public officials.

Traffic Disruptions

Construction activities under all build alternatives would result in some traffic disruption on I-80 and the East Span due to temporary full and partial bridge lane closures during off-peak travel times.

In general, construction of the Retrofit Existing Structure Alternative would result in longer and more frequent lane closures, compared to the replacement alternatives, because construction would occur on the bridge while it is open to traffic. Lane closures could be expected almost every day during the construction period. This condition would persist for much of the six years estimated to construct the retrofit alternative. Closures would be scheduled during periods of the day with lower traffic volumes, with most closures occurring at night.

During the initial stage of construction of the replacement alternatives, the temporary detours on YBI would be connected to the YBI viaduct just east of the tunnel portal. This construction would require closure of traffic lanes on the SFOBB during off-peak travel times. Caltrans is continuing to investigate lane and bridge closures to transition

traffic from the existing bridge to the temporary detours and to a replacement bridge. Caltrans would plan the closures in an effort to simultaneously minimize public inconvenience, facilitate construction, and maximize public safety. The closures would be scheduled to occur during off-peak hours, to the maximum extent feasible.

The replacement alternatives could potentially create additional delays as "rubbernecking" drivers on the existing SFOBB watch construction of the new superstructure and as drivers watch dismantling of the existing bridge from the new bridge. Other activities would generally not be noticeable to drivers, given the restricted field of vision on the existing bridge and the proximity of a new bridge to the existing bridge.

Yerba Buena Island. Construction of any of the build alternatives could cause temporary traffic disruptions as construction-related traffic would be noticeable on local roadways (primarily on Macalla Road) and could contribute to localized congestion from time to time. Heavy trucks on Macalla Road may conflict with other vehicles due to the narrow width and steep grades of the roadway. Truck traffic on Macalla Road would be regulated by flaggers to ensure that there are no conflicts between oversized vehicles and other vehicles. Heavy construction vehicles would also likely cause damage to the pavement on Macalla Road. Local streets would be repaired following completion of East Span construction activities.

Equipment, materials, and work crews would be transported to YBI by motor vehicles and/or barges. As a result, there would be an increase in the volume of vehicles entering and exiting the island. Caltrans will investigate including traffic control measures in the contract specifications to minimize the impacts of the traffic volume increase, which could affect the capacity of the on- and off-ramps.

In addition to temporary traffic disruptions, there would be some longer-term disruptions to YBI roadways (i.e., closures and temporary detours) during the construction period of a replacement alternative. The westbound on-ramp and the eastbound off-ramp on the east side of the island would be closed for approximately 3 years. YBI would remain accessible from the SFOBB from both eastbound and westbound directions. The SFOBB would also remain accessible from YBI in the eastbound and westbound directions.

When the eastbound temporary detour is constructed, Southgate Road would be closed for approximately 2 years. As a result, access from one side of the bridge to the other, east of the tunnel, would be temporarily eliminated. Access from one side of the island to the other would be temporarily via Treasure Island Road. During this time, vehicles traveling to or from San Francisco on the south side of the island would need to make a U-turn at the Treasure Island/Macalla Road intersection.

Several roadways on YBI would require modifications as a result of construction of the new East Span. Macalla Road would be lowered and realigned in the vicinity of Southgate Road to avoid new bridge columns. The USCG road would also have to be realigned to avoid columns. The road that provides access to Building 262 would be modified in two phases (once to avoid the eastbound temporary detour and ultimately

to avoid columns of the new bridge.) These roadways would remain open during realignment to allow for USCG Station access. However, there may be periods when traffic would be restricted to one lane and directed by flaggers.

Macalla Road would remain operable during construction; however, it may be completely closed for brief intervals to all traffic, including USCG traffic. The closures would be a safety measure implemented during certain construction operations, such as the movement of heavy materials that are suspended by crane over the road. The USCG requires emergency access to its facility 24 hours/7 days a week by police, fire, and ambulance services. To maintain access to the maximum extent feasible, Caltrans will investigate including emergency access in the contractor specifications. Requirements in the specifications could include a communication system between field personnel of the contractor and emergency response units to allow for early notification of the need to provide access, making the USCG aware of any closures in advance and setting a maximum time limit for each closure. Caltrans will continue to coordinate with the USCG to establish the most effective means of providing emergency access.

Because the eastern end of YBI would be used for construction staging, public access to the construction area would be restricted. There would be no public access to the Parade Grounds. However, the USCG would have access to its facilities through the construction zone.

A temporary restriction of access to Building 267, the garage at Quarters 10, would be required for construction of any replacement alternative. Vehicular access to the garage would not be available for approximately one day while the driveway is regraded to align with the new Macalla Road configuration. If determined necessary by Caltrans, temporary replacement parking and a temporary walkway from the parking area to Quarters 10 would be provided. The replacement parking would be located as close to Quarters 10 as feasible, such as near Building 240.

The staircase on YBI linking the USCG base with the bus stop at the top of the hill would be displaced due to the placement of the bridge footings for Replacement Alternatives N-2 and N-6. Under Replacement Alternative S-4, the stairway would remain at its current location, but would be closed during construction.

Mitigation:

To maintain access to the USCG facility, Caltrans would require that the contractor construct a detour around the column foundations to keep Macalla Road open or provide another travel way for USCG personnel.

Macalla Road would remain operable during construction; however, it may be completely closed for brief intervals to all traffic, including USCG traffic. To maintain access to the maximum extent feasible, Caltrans will investigate including emergency access in the contractor specifications. Requirements in the specifications could include a communication system between field personnel of the contractor and emergency response units to allow for early notification of the need to provide access,

making the USCG aware of any closures in advance and setting a maximum time limit for each closure. Caltrans will continue to coordinate with the USCG to establish the most effective means of providing emergency access.

Temporary detours would be constructed and flaggers employed to ensure motorist safety for USCG vehicles in the construction zone. Barges would deliver wide and oversized construction loads, where possible.

Caltrans would limit contractor parking to the temporary construction easement.

With a northern alternative, Caltrans would construct a new stairway after consulting with USCG, Navy, and the CCSF about appropriate location. Construction-period shuttle service would be provided with any build alternative to take USCG personnel to and from the MUNI bus stop.

Oakland Touchdown Area. During construction, Replacement Alternatives N-2 and N-6 (Preferred) would require closing the restricted Caltrans maintenance access road on the north side of I-80, which is currently used by authorized vehicles only, eliminating vehicle access to the shoreline west of Radio Beach.

Higher volumes of construction-related vehicle traffic anticipated during construction of the Retrofit Existing Structure Alternative and the replacement alternatives may slightly affect traffic and transit operations. The increased number of trucks on Maritime Street, for example, could potentially cause minor delays to traffic and to Alameda-Contra Costa Transit District (AC Transit) Transbay Route A and Local Route 13. The delay would be roughly equivalent to a missed signal cycle and would be within the range of normal traffic conditions, particularly during peak commute hours. Burma Road and Maritime Street also serve the Port of Oakland and local industry and currently accommodate heavy trucks. The additional construction trucks that would operate on Burma Road and Maritime Street during construction would not likely increase traffic congestion on these streets. No mitigation is recommended for this minor potential delay.

Marine Operations

The in-water construction activities required to construct the retrofit and replacement alternatives would have similar impacts on the movement of commercial vessels and recreational boats. Non-project-related marine traffic would be diverted from areas of construction where barge mooring, pile driving operations, and trestles are in use. The main navigation opening near YBI would remain open during construction. The width of the navigation opening would be reduced during construction but not less than the minimum width required by the USCG. Although navigation routes may be modified, they would meet USCG regulations and standards, and vessels would be able to move unencumbered; any necessary modifications to existing marine traffic would be coordinated with the USCG.

Under the replacement alternatives, the nature, duration, and location of marine construction activities would continually vary due to in-water activities associated with construction of the main span and skyway and dismantling the existing East Span. The

presence of barges, other construction vessels, and temporary falsework would restrict the navigation opening. Additionally, temporary closures of portions of the navigational opening could occur during critical construction points due to overhead hazards.

Mitigation:

Caltrans will consult with the USCG to implement a vessel warning system for periods when construction vessels are placed in the water within the bridge construction zone. Caltrans would obtain a permit to modify the existing bridge or construct a replacement bridge from the USCG pursuant to Section 9 of the Rivers and Harbors Act and the General Bridge Act of 1946. Notification to mariners and other requirements will be specified in the bridge permit.

4.14.3 Construction-period Visual Impacts

All construction activities, whether for seismic strengthening proposed under the Retrofit Existing Structure Alternative or for the replacement alternatives, would involve the use of barges, heavy equipment, stockpiles of soils and materials, and other visual signs of construction. While noticeable to residents on YBI and others in the vicinity, these short-term visual changes, limited to the construction period of approximately five years, would not substantially alter the character of the Bay or the communities on either side. These short-term visual changes do not include the long-term impacts of the clearing and grubbing operations. Approximately 350 trees on the eastern part of YBI would be removed to provide staging areas and clearances for heavy equipment. Most of these trees are eucalyptus with a few being coast live oaks. This visual impact would be mitigated as discussed in Section 4.3.4.

Residents of the Bachelor Enlisted Quarters and the USCG officers' housing as well as users of YBI would experience the most noticeable visual changes during the construction period. Flat areas on YBI are expected to be used as a construction staging area. Activities at this location may block Bay views from Quarters 1-7. Retrofit of existing columns on YBI under the Retrofit Existing Structure Alternative could require temporary structures, such as scaffolding, that would interfere with existing views. New columns constructed under the replacement alternatives would add similar temporary structures.

Replacement alternatives, including the Preferred Alternative, would require the construction of temporary detours on YBI (see drawings of the temporary detours in Appendix A, Figures 2-16.2, 2-17.2, and 2-18). The detours would be operational for approximately 2 years. The period from the beginning of construction to the end of their operational use would be approximately 4 years. The detours may be removed as soon as they are no longer needed to carry traffic or they may be removed as one of the last steps of bridge construction on YBI, because the contractor may use them as platforms from which to construct other portions of the bridge. Columns approximately 2 meters (6.5 feet) in diameter would be constructed to support these temporary detours. The number of columns to be placed on YBI would range from 59 for Replacement Alternative S-4 to 91 columns for Replacement Alternative N-2. The temporary columns would likely restrict views from YBI and would be visible from close- and moderate-range views to the

east side of YBI. However, these columns would be temporary and would be dismantled as soon as possible after opening the new bridge to traffic.

The temporary detours would impact the local vegetation, topography, and, consequently, the appearance of YBI. See Section 4.3.4 for a more detailed description of the impacts of each alignment.

Nighttime construction activities would involve the use of lighting equipment, which could cause glare, potentially affecting residents and marine traffic in the immediate vicinity.

Mitigation:

To reduce glare from lighting used during nighttime construction activities, Caltrans would require project contractors to direct lighting onto the immediate area under construction only and to avoid shining lights towards residences and marine traffic.

4.14.4 Construction-period Air Quality

During some stages of project construction, the Retrofit Existing Structure Alternative and the replacement alternatives would generate air pollutant emissions. The largest sources of anticipated pollutants would be dust generated by excavation, grading, and other ground-disturbing activities on YBI and the Oakland Touchdown, and exhaust emissions from equipment and marine vessels. All construction-related emissions would be temporary and would vary from day to day, depending on the type of work being done. Construction-related emissions would also be experienced at different locations during the construction process, depending on the area(s) under construction at any one time and the distance to likely receptors. Because of the changing nature of these conditions (i.e., construction activity, construction location, and distance to receptors), an exact estimate of total construction emissions and impacts is not possible.

Measures to reduce emissions during construction, as specified in Caltrans' Standard Specifications, include the following:

- Watering exposed soil surfaces;
- Covering trucks transporting dust-producing material leaving or entering a construction site;
- Reducing construction vehicle travel speeds on unpaved surfaces;
- Maintaining equipment per manufacturers' specifications; and
- Conforming with all air pollution rules, regulations, ordinances, and statutes.

Based on the requirement that these measures be included in all contract specifications, no mitigation is proposed.

An air quality evaluation of dredging operations has been completed as part of the Dredged Material Management Plan (DMMP) (see Appendix M) to address the Environmental Protection Agency's (EPA) concerns about construction-period air quality. The analysis concludes that the emissions from dredging would represent an

insignificant portion of the Bay Area emissions. Caltrans would provide the air quality analysis to allow the ACOE to comply with the Clean Air Act.

4.14.5 Construction-period Noise and Vibration

Construction Noise

The Retrofit Existing Structure Alternative and replacement alternatives would result in intermittent and varying levels of construction noise. The Transportation Research Board indicates that typical construction noise levels at a reference distance of 15 meters (50 feet) are:[12]

Ground Clearing (e.g., backhoe)	80 dBA
Excavations (e.g., excavator)	85 dBA
Foundations (e.g., auger drill rig)	85 dBA
Erection of Structures (e.g., concrete mixer)	85 dBA
Finishing (e.g., paver)	85 dBA

Most construction activity related to this project would be associated with the last four categories (which include some of the noisiest operations). Dismantling activities, such as cutting steel and breaking concrete, would probably have similar noise levels. The Transportation Research Board information indicates that the typical noise level generated on a construction site could reach 85 dBA at a distance of 15 meters (50 feet). Noise levels generated by construction equipment (or by any "point source") decrease at a rate of approximately six decibels (dB) per doubling of distance away from the reference distance of 15 meters (50 feet). For instance, at a distance of 60 meters (200 feet) from a noise source, the noise levels would be about 12 dB lower than at the 15-meter (50-foot) reference distance. At Quarters 8, a residence close to all build alternatives (approximately 50 meters [164 feet] away from the construction area for the new bridge structure), the noise level resulting from typical construction activities would be approximately 75 dBA L_{eq}. This is three dBA higher at this location than noise levels caused by existing peak-noise-hour traffic on the existing East Span and would not likely result in a perceptible change. Under the northern replacement alternatives, a noise level of 75 dBA L_{eq} would also occur at Quarters 1, which is not occupied. During construction of the eastbound temporary detour, construction activities would occur approximately 22 meters (72 feet) from the Bachelor Enlisted Quarters. As a result, noise levels during temporary detour construction may be as loud as 82 dBA at this location, an increase of approximately 10 dBA over existing conditions. While construction of a replacement bridge would last a majority of the construction period (approximately 5 years of the total construction period of 7 years, which includes 2 years for dismantling the existing East Span), temporary detours would be constructed in a shorter period of time (approximately 2 years).

[12] Transportation Research Board, National Research Council, National Cooperative Highway Research Program Synthesis 218, Mitigation of Nighttime Construction Noise, Vibrations, and Other Nuisances, 1999.

At a distance of 100 meters (328 feet), the noise from regular construction activities would be approximately 69 dBA L_{eq}; at 200 meters (660 feet), construction noise levels would be approximately 63 dBA L_{eq}; while at 400 meters (1,312 feet), the noise levels would be approximately 57 dBA L_{eq}. Except for construction equipment and material staging areas, construction activities and associated noise would move along the project route as construction proceeded, and, thus, these levels would vary and be intermittent.

Two activities not mentioned in the Transportation Research Board list of noise–generating activities above are rivet busting and pile driving. The Retrofit Existing Structure Alternative would entail a substantial amount of rivet removal. Rivet busting may also be required during dismantling of the existing structure under the replacement alternatives. Observed unshielded noise levels for rivet removal have varied from 86 to 98 dBA at a distance of 15 meters (50 feet). The buildings closest to the existing structure (e.g., USCG Building 40 and Navy Building 213) may experience noise levels (approximately 80 to 92 dBA) when rivet removal is occurring on the bridge portions closest to them during the Retrofit Existing Structure Alternative. Building 40 is currently used for administration purposes and Building 213 is used to store a fire truck. These buildings would be displaced with the northern replacement alternatives. Building 40 would be displaced with Replacement Alternative S-4. The next closest building not displaced by a replacement alternative is Building 262, which is not occupied. Noise levels in this area from rivet busting would be approximately 79 to 91 dBA.

Pile driving during construction would generate noise that is unique in terms of noise level, audible characteristics, and time pattern. The higher levels of pile driver noise, which are maximum levels (L_{max}) of approximately 105 dBA at a distance of 15 meters (50 feet), consist of very-short-duration impact sounds (a "bang" or "clang" noise) concentrated during a 10- to 30-minute period while an individual pile is being driven. These impact sounds attenuate with distance such that the maximum levels will be 99 dBA at 30 meters (100 feet), 93 dBA at 60 meters (200 feet), and 87 dBA at 120 meters (400 feet). Intermittent noise of this nature can be very intrusive to nearby receptors.

Pile driving on YBI would be performed intermittently over a period of about 2 years for all build alternatives. Most of the temporary detours would not require pile driving. The closest pile driving to buildings under the Retrofit Existing Structure Alternative would be 55 meters (180 feet) from Quarters 1 on YBI, resulting in noise levels around 95 dBA.

The replacement alternatives would have pile driving work as close as 45 meters (150 feet) to Building 262 and 80 meters (260 feet) to Quarters 8 and the Bachelor Enlisted Quarters. Quarters 8 and the Bachelor Enlisted Quarters, which are occupied, would experience noise levels from pile driving of approximately 92 dBA. Noise levels around Building 262, which is not occupied, would be approximately 96 dBA. Pile driving would also occur within 60 meters (200 feet) of Building 240 (occupied residential units on Macalla Road, northwest of Quarters 10). Noise levels during pile driving in the vicinity of this building would be approximately 93 dBA.

Based on noise levels recorded during the Pile Installation Demonstration Project, completed in December 2000, and assuming a drop-off rate of 6 dBA per doubling of distance, previous predictions of noise levels near the USCG facility are accurate within 2 dBA. It was also found that noise levels upwind from pile driving operations sometimes

exceed the expected attenuation of 6 dBA per doubling distance from 3 to 8 dBA. That is, upwind locations are quieter than downwind locations at the same distance from a noise source. Winds in the Bay Area have a westerly component, which would put Treasure Island and YBI in an upwind (quieter) condition.[13] Assuming a building attenuation of 25 dBA for the USCG quarters, it is expected that the highest interior noise levels during nearby pile driving operations will be approximately 67 dBA.

Construction noise is unavoidable, temporary, and limited to the time of the construction in any one location (except near the staging areas as noted above). Some nearby USCG residents could be adversely impacted by construction noise. The USCG operates a 24-hour search and rescue operation and, as such, has personnel working in shifts. As a result, there may be staff sleeping at various times of the day. During prolonged pile driving activities within 120 meters (400 feet) or less of USCG facilities, sleep may be problematic. Potential abatement measures may be a combination of attenuation at the noise source, and/or attenuation at the receptor. Caltrans has already investigated such measures as selecting a quieter pile driver, placing a shroud around the hammer, using portable shielding, sound blankets, and plywood sheets. These measures were found not to work for a variety of reasons, including not being effective, challenges in implementation on YBI due to wind conditions and elevation, and cost.

The film studios on TI are located more than 400 meters (1,312 feet) from the project construction site and a minimum of 610 meters (2,000 feet) from the closest pile driving. As a result, the film studios would experience noise levels below 57 dBA during general construction activities and maximum noise levels of approximately 74 dBA during pile driving. During the majority of the construction period, construction-related noise would be below background noise levels (modeled at 67 dBA) at the film studios. Pile driving could result in an increase of up to 7 dBA over existing conditions.

Construction-period Noise Abatement. All construction equipment would be required to conform to the provisions in Section 7-1.011 of the latest edition of Caltrans' Standard Specifications to minimize noise from construction activities, such as maintaining equipment mufflers in proper operating order. The contractor will be required to comply with local noise control ordinances to the extent practicable.

Caltrans will continue to consult with the USCG to identify and implement as feasible reasonable measures to reduce construction-related noise levels at USCG facilities. In addition, Caltrans is continuing to investigate the possibility of limiting the hours for pile driving to reduce the construction noise impacts to residents of YBI and TI.

Data obtained from a Pile Installation Demonstration Project, completed in December 2000, have provided additional information on noise levels from pile driving. The final results will be used to refine appropriate mitigation measures. Caltrans could require contractors to install and use sound-attenuating fabric shrouds around the hammer/pile impact area of pile driver equipment during pile driving to the extent possible to reduce noise levels in sensitive areas such as at the Bachelor Enlisted Quarters. Over-water

[13] Noise and Vibration Measurements with the Pile Installation Demonstration Project, Illingworth & Rodkin, January 26, 2001.

construction sites may not be suitable for this technique. Where practicable, pile holes would be pre-drilled to reduce impacts of pile driving.

Temporary Detour Traffic Noise

To allow for continued utilization of the SFOBB during construction, temporary detours would be constructed at YBI and at the Oakland Touchdown area. It is anticipated that these temporary detours would be in use by motor vehicles for approximately 2 years. The period from the beginning of construction to the end of their operational use would be approximately 4 years. The detours may be removed as soon as they are no longer needed to carry traffic or they may be removed as one of the last steps of bridge construction on YBI, because the contractor may use them as platforms from which to construct other portions of the bridge. These temporary detours vary in design and configuration depending upon the alternative.

Noise generated by detour traffic is anticipated to be similar to noise from existing traffic; e.g., less than 74 dBA at Quarters 1-7 and less than 72 dBA at the USCG residential units. Traffic on the temporary detours used for any of the replacement alternatives would be closer to some locations compared to the existing bridge structure. With the northern alternatives, the temporary detours would be slightly closer to Quarters 1-7 and farther away from the Bachelor Enlisted Quarters and recreational area compared to Replacement Alternative S-4. Noise modeling of the replacement alternatives indicates that noise levels might increase by 1 to 2 decibels at these locations when the temporary detours are closest to them, but these increases would generally not be perceivable.

For the northern replacement alternatives, traffic noise from the temporary detours at the Bachelor Enlisted Quarters would likely be less (1 to 2 decibels lower) than anticipated for Replacement Alternative S-4 due to the greater distance between the temporary detours and the USCG buildings.

Construction Vibration

Vibration levels from construction activities such as pile driving and dismantling of existing column foundations have the potential to cause building damage under certain circumstances. There are no federal or state standards for vibration levels. However, Caltrans has measured vibrations generated during various construction activities on projects throughout the state. Pile driving has frequently been done at distances of 8 to 15 meters (25 to 50 feet) from buildings without causing damage; however, damage that could occur includes displacement of soil and resulting lateral movement. In general, pile driving could produce ground-borne vibration levels that might be perceptible to humans within approximately 200 meters (660 feet) of the pile driving activity, but a building that is more than 15 to 30 meters (50 to 100 feet) from pile driving would not be damaged.[14]

Each of the build alternatives would require work on YBI and at the Oakland Touchdown that would generate vibration. Potential for impacts to structures on YBI and at the Oakland Touchdown is discussed below. The film studios on TI are not

[14] Caltrans, Transportation Related Earthborne Vibrations, Caltrans Experiences, 1992.

discussed below because they are approximately 610 meters (2,000 feet) from the closest pile driving. Vibration guidance from the Federal Transit Administration (FTA) indicates that equipment highly sensitive to vibration would not be affected by pile driving activities more than 274 meters (900 feet) away.[15] As a result, vibration from construction activities would not be perceptible at the film studios.

Retrofit Existing Structure Alternative. This alternative would require pile driving about 55 meters (180 feet) from the closest building (Quarters 1) and would require foundation dismantling about 45 meters (150 feet) from Building 262. At the Oakland Touchdown, the closest foundation dismantling would be about 45 meters (150 feet) from the Key Pier Substation.

Since these buildings are more than 30 meters (100 feet) away from construction activities that would generate vibration, it is expected that vibration levels experienced at these properties would be well below the architectural damage risk level.

Replacement Alternatives. Under the replacement alternatives, the closest building on YBI to pile driving and foundation dismantling would be Building 262. Pile driving would occur approximately 60 meters (195 feet) from this structure, while the closest foundation dismantling would be approximately 45 meters (150 feet) away. The closest pile driving on the Oakland Touchdown would be 110 meters (360 feet) from the Key Pier Substation, and the closest foundation dismantling would be about 45 meters (150 feet) away.

Since these buildings are more than 30 meters (100 feet) away from construction activities that would generate vibration, it is expected that vibration levels experienced at these properties would be well below the architectural damage risk level.

Vibration Abatement:

While no architectural damage is expected to occur as a result from the East Span Project, historic properties (the Senior Officers' Quarters Historic District, Quarters 8, Quarters 10, Building 267, and Building 262) would be monitored for damage as a result of construction activities, including the possible use of vibration-measuring devices on the buildings. Caltrans would photographically document the condition of these buildings prior to the start of construction to establish the baseline condition for assessing damage. Caltrans would ensure that any damage to the buildings resulting from construction activities be repaired in accordance with the Secretary of the Interior's Standards for Rehabilitation.

4.14.6 Hazardous Wastes

The potential for encountering pre-existing hazardous wastes is present during any construction project. Hazardous wastes sites are known to exist in the project area. Hazardous wastes impacts would occur if construction workers, members of the public, and/or Navy and USCG personnel were exposed to hazardous wastes during

[15] Federal Transit Administration, Transit Vibration Assessment Procedures, April 1995.

grading and excavation activities, or if the likelihood of hazardous waste migration were increased by construction activities.

Potential sources of contamination have been identified within all of the project alternative alignments. Areas known or likely to contain contaminated soil and/or groundwater were identified in Section 3.6 of this report. A comparison of potential impacts by alternative is in Section 4.6.

Mitigation: Construction and dismantling of all structures would include procedures for the identification, abatement, handling, and disposal of contaminated materials, as well as worker health and safety. Mitigation measures are discussed in more detail in Section 4.6.3 — Hazardous Wastes, Mitigation. All procedures would be consistent with Caltrans' guidelines and all federal, state, and local laws and regulations.

4.14.7 Water Resources and Water Quality

The project could have adverse impacts on water quality related to construction activities. These include, but are not limited to: excavations for column foundations, resulting in possible groundwater contamination; potential surface water impacts from dredging and dewatering operations, concrete placement, and washout activities; management and application of chemical products; construction activities performed on barges; use of floating batch plants; and the potential for accidental spills from construction equipment and materials. Additional construction-related impacts are associated with the dismantling of the existing East Span, which could include discharges of waste material, accidental spills, and resuspension of bottom sediments.

Statewide NPDES Permit No. CAS000003 applies to the project facilities during construction. The NPDES permit requires that a Storm Water Pollution Prevention Plan (SWPPP) be prepared for any construction project that disturbs an area greater than five acres or for any project that is located within or near a water-related sensitive environment.

A SWPPP would be prepared for this project. The purpose of the SWPPP would be to:

- Identify pollutant sources that may affect the quality of the discharges of storm water associated with the construction activities of the project; and

- Identify, construct, and implement storm water pollution control measures to reduce pollutants in storm water discharges from the construction site during and after construction.

The objectives of the SWPPP would be: 1) to minimize the degradation of off-site receiving waters to the maximum extent practicable with the current Best Management Practices (BMPs) for the construction industry and 2) to reduce the mass loading of chemicals and suspended solids to the downstream drainage systems and the receiving water bodies.

The preparation of the SWPPP would be based on the principles of BMPs, not numeric effluent limitations, to control and abate the discharge of pollutants into receiving waters. BMPs are structural devices, such as silt fences and straw bales, and non-structural devices, such as good housekeeping and construction-related waste management. Some of Caltrans' BMPs are as follows:

- Spill Prevention and Control;
- Solid Waste Management;
- Hazardous Waste Management;
- Concrete Waste Management;
- Sanitary/Septic Waste Management;
- Vehicle and Equipment Maintenance;
- Straw Bales;
- Illicit Discharge/Illegal Dumping Reporting; and
- Liquid Waste Management.

The SWPPP would be amended whenever there is a change in construction or operations which may affect the discharge of substantial quantities of pollutants into the receiving waters.

Since the dismantling work of the existing East Span under the replacement alternatives would be performed under a separate contract, a SWPPP specific to the dismantling work would be prepared as part of the separate contract. The SWPPP would address specific dismantling activities and BMPs to be implemented to minimize the discharge of pollutants associated with these activities.

4.14.8 Natural Resources

Permanent or temporary impacts to natural resources may occur in association with the build alternatives. This section discusses temporary impacts to wildlife species or habitat. Natural resources in the project area were evaluated in accordance with the provisions of state and federal environmental statutes and regulations listed in Section 3.9.1 — Natural Resources, Regulatory Setting. Mitigation measures, where appropriate, have been developed in consultation with regulatory and permitting agencies.

Temporary impacts to natural resources could result from construction activities on land at YBI and the Oakland Touchdown area and in open water for all build alternatives. Three categories of temporary natural resource impacts are discussed below: (1) temporary fill in San Francisco Bay (including open and shallow water areas and special aquatic sites) and temporary fill in Other Waters of the U.S. (including open and shallow water areas); (2) special aquatic sites such as wetlands, eelgrass beds, and sand flats; and (3) wildlife such as endangered species, migratory birds, marine mammals, and fisheries.

Placement of Temporary Fill in San Francisco Bay and Other Waters of the U.S.
The temporary placement or removal of fill in San Francisco Bay and Other Waters of the U.S. are subject to federal and state regulations. The ACOE regulates fill in Other Waters of the U.S. pursuant to Section 404 of the federal Clean Water Act (CWA). BCDC regulates fill in San Francisco Bay pursuant to the state McAteer-Petris Act. The CWA and the McAteer-Petris Act define temporary fill differently. The regulatory definitions of fill are discussed in Section 4.9.1 — Placement of Fill in San Francisco Bay and Other Waters of the U.S. Impacts associated with permanent fill are also addressed in Section 4.9.1.

Two types of temporary impacts resulting from construction activities were evaluated for each of the build alternatives: (1) the temporary change in the volume of San Francisco Bay and Other Waters of the U.S.; and (2) the temporary change in the surface area of San Francisco Bay and Other Waters of the U.S.

Reductions in the volume and surface area of San Francisco Bay and Other Waters of the U.S. are recognized under the McAteer-Petris Act and the CWA as negative impacts. Temporary fill may impair the physical, chemical, and biological integrity of a water body. Temporary fill may also impact San Francisco Bay's ability to maintain adequate oxygen levels and assimilate and flush wastes.

Temporary Change in Volume of San Francisco Bay and Other Waters of the U.S. All build alternatives would require the placement of temporary fill for in-Bay construction that would temporarily decrease the volume of San Francisco Bay and Other Waters of the U.S. Temporary fill for the replacement alternatives may include:

- Barge docks at YBI to facilitate transport of construction materials, equipment, and personnel;
- Trestles in shallow water areas at the Oakland Touchdown for construction access;
- Small boat dock and concrete load conveyor at the Oakland Touchdown to facilitate construction;
- Cofferdams to install piles and pile caps;
- A geotube for dewatering and construction of the westbound roadway at the Oakland Touchdown;
- Falsework to support new construction; and
- Falsework piers in deep water areas to erect and support the main suspension span.

Construction of the Retrofit Existing Structure Alternative would require placement of cofferdams at new and existing piers and pile-supported trestles in shallow water areas

to provide access for construction equipment and material (see Section 2.6.1 — Retrofit Existing Structure Alternative for a description of construction activities).

Although all fill for temporary structures would be removed at project completion, construction activities would temporarily decrease the volume and surface area of San Francisco Bay and Other Waters of the U.S. Some temporary fill, such as the cofferdams, geotube, falsework, and temporary support structures for the main span would be removed following completion of a particular segment of work. Other temporary fill, such as barge docks, access trestles, the small boat dock, and the concrete conveyor would be in place for the duration of construction, which is approximately six years.

As a result, the build alternatives would have a negative impact. Table 4.14-1 summarizes the temporary change in the volume of San Francisco Bay and Other Waters of the U.S. as a result of the build alternatives.

Table 4.14-1 Temporary Change in Volume of San Francisco Bay and Other Waters of the U.S. - Build Alternatives

Build Alternative	Change in Volume of Other Waters of the U.S. (ACOE Jurisdiction)	Change in Volume of San Francisco Bay BCDC Jurisdiction)
Replacement Alternative N-6 (Preferred)	Decrease of 41,000 cubic meters (54,000 cubic yards)	Decrease of 48,000 cubic meters (63,000 cubic yards)
Replacement Alternative N-2	Decrease of 41,000 cubic meters (54,000 cubic yards)	Decrease of 48,000 cubic meters (63,000 cubic yards)
Replacement Alternative S-4	Decrease of 45,000 cubic meters (58,000 cubic yards)	Decrease of 42,000 cubic meters (54,000 cubic yards)
Retrofit Existing Structure	Decrease of 13,000 cubic meters (17,000 cubic yards)	Decrease of 12,000 cubic meters (15,000 cubic yards)

Temporary Change in Surface Area of San Francisco Bay and Other Waters of the U.S. All build alternatives would require the placement of fill for in-Bay construction that would temporarily decrease the surface area of San Francisco Bay and Other Waters of the U.S. Temporary fill for the replacement alternatives may include:

- Barge docks at YBI to facilitate transport of construction materials, equipment, and personnel;
- Trestles in shallow water areas at the Oakland Touchdown for construction access;
- Small boat dock and concrete load conveyor at the Oakland Touchdown to facilitate construction;
- Cofferdams to install piles and pile caps;

- A geotube for dewatering and construction of the westbound roadway at the Oakland Touchdown;
- Falsework to support new construction; and
- Falsework piers in deep water areas to erect and support the main suspension span.

Construction of the Retrofit Existing Structure Alternative would require placement of cofferdams at new and existing piers and pile-supported trestles in shallow water areas to provide access for construction equipment and material (see Section 2.6.1 — Retrofit Existing Structure Alternative for a description of construction activities).

Although all fill for temporary structures would be removed at project completion, construction activities would temporarily decrease the volume and surface area of San Francisco Bay and Other Waters of the U.S. Some temporary fill, such as the cofferdams, geotube, falsework, and temporary support structures for the main span would be removed following completion of a particular segment of work. Other temporary fill, such as barge docks, access trestles, the small boat dock, and the concrete conveyor would be in place for the duration of construction, which is approximately six years.

As a result, the build alternatives would have a negative impact. Table 4.14-2 summarizes the temporary change in the surface area of San Francisco Bay (including high-level suspended and cantilevered fill) and Other Waters of the U.S. that would occur as a result of the build alternatives.

Table 4.14-2 Temporary Change in Surface Area of San Francisco Bay and Other Waters of the U.S. – Build Alternatives

Build Alternative	Change in Surface Area of Other Waters of the U.S. (ACOE Jurisdiction)	Change in Surface Area of San Francisco Bay (BCDC Jurisdiction)
Replacement Alternative N-6 (Preferred)	Decrease of 0.8 hectare (1.97 acres)	Decrease of 7.12 hectares (17.6 acres)
Replacement Alternative N-2	Decrease of 0.8 hectare (1.97 acres)	Decrease of 7.07 hectares (17.48 acres)
Replacement Alternative S-4	Decrease of 1.05 hectares (2.59 acres)	Decrease of 6.25 hectares (15.44 acres)
Retrofit Existing Structure	Decrease of 0.36 hectare (0.90 acre)	Decrease of 0.36 hectares (0.90 acres)

Special Aquatic Sites

Temporary impacts and disturbance to special aquatic sites are summarized in Table 4.14-3.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would not cause temporary impacts or disturbance to wetlands, sand flats, or eelgrass. There would be no dredging for barge access channels where special aquatic sites are located.

Replacement Alternatives.

Wetlands. No temporary impacts to wetlands would occur as a result of Replacement Alternatives N-2, N-6, or S-4. Replacement Alternative S-4 would permanently remove the two non-tidal wetlands (see Section 4.9,2 — Special Aquatic Sites). The non-tidal wetlands south of the Oakland Touchdown and tidal wetlands at YBI would be avoided and marked as environmentally sensitive areas (ESAs). This would entail placing exclusion devices around them during construction.

Sand Flats. During construction of Replacement Alternatives N-2 and N-6, approximately 0.69 hectare (1.7 acres) of sand flats along the northern shore of the Oakland Touchdown area would be temporarily disturbed. Temporary impacts to intertidal sand flat habitat would result from the placement of a geotube for dewatering purposes and mud boils. Trestles used with Replacement Alternative S-4 would temporarily impact 0.01 hectare (0.02 acre) of sand flats along the south shore of YBI.

Eelgrass Beds. During construction of the replacement alternatives, 0.01 hectare (0.02 acre) of eelgrass would be temporarily disturbed north of the Oakland Touchdown area. Temporary impacts would be caused by increased turbidity from dredging, pile driving, barge maneuvering, and cofferdam construction.

Table 4.14-3 Temporary Impacts to Special Aquatic Sites

	Wetlands	Sand Flats	Eelgrass Beds
Area Impacted by Replacement Alternative N-6	No temporary impact.	0.69 hectare (1.70 acres) at Oakland Touchdown as a result of placement of the geotube.	0.01 hectare (0.02 acre) at the Oakland Touchdown due to increased turbidity from dredging, barge maneuvering, pile driving, and cofferdam construction.
Area Impacted by Replacement Alternative N-2	No temporary impact.	0.69 hectare (1.70 acres) at Oakland Touchdown as a result of placement of the geotube.	0.01 hectare (0.02 acre) at the Oakland Touchdown due to increased turbidity from dredging, barge maneuvering, pile driving, and cofferdam construction.
Area Impacted by Replacement Alternative S-4	No temporary impact. However, there are permanent impacts (see Table 4.9-5).	0.01 hectare (0.02 acre) at YBI as a result of temporary trestle construction.	0.01 hectare (0.02 acre) at the Oakland Touchdown due to increased turbidity from dredging, barge maneuvering, pile driving, and cofferdam construction.
Area Impacted by Retrofit Existing Structure Alternative	No temporary impact.	No temporary impact.	No temporary impact.
Mitigation	Avoidance of habitat by marking the wetlands as Environmentally Sensitive Areas (ESAs). The ESAs would be marked in the field using fencing materials, buoys, or other appropriate, highly visible materials.	In addition to measures listed in Table 4.9-5, placing geotextile fabric and plywood onto the sand flats before placing the geotube to minimize mud boils.	Minimization of impacts to eelgrass through use of specific dredge types, including mechanical clamshell excavator equipment; a turbidity control program, which may possibly include turbidity curtains that control and contain turbidity; marking eelgrass beds outside the barge access channel as ESAs; harvesting eelgrass from within the barge access channel and replanting in adjacent beds as pilot program; restoring portions of the barge access channel and replanting with eelgrass to facilitate eelgrass colonization.

Source: Caltrans, 2000.

Mitigation for Replacement Alternatives:

Sand Flats. To minimize impacts to sand flats at the Oakland Touchdown area, Caltrans would place geotextile fabric and plywood onto the sand flats before placing the geotube. This measure would reduce the potential for mud boils. That portion of the sand flats affected by the temporary placement of a geotube and mud boils would be restored to pre-existing conditions following construction as described in Section 4.9.6 — Natural Resources, Mitigation.

Eelgrass Beds. Construction controls and ESAs would be included in the project plans, specifications, and estimates to avoid impacts as much as possible. Caltrans would monitor for turbidity due to dredging, pile driving, barge maneuvering, and mud boils. A turbidity control program, which may possibly include turbidity curtains, and limitations on barge and tug boat maneuvering would be required. Caltrans is continuing to investigate the design, maintenance, and effectiveness of turbidity curtains. Post-construction surveys to evaluate impacts of turbidity on eelgrass would also be implemented. If additional eelgrass beds have been affected during construction, Caltrans would consult with the permitting agencies to determine if additional mitigation is warranted.

Caltrans would restore a portion of the barge access channel to its original bathymetry. The restoration would occur following construction. Some of the dredged material and excavated sand from the project site suitable for in-Bay disposal would be stockpiled and used to restore the barge access channel to suitable depths for eelgrass re-colonization. The restored channel outside the area shadowed by the westbound structure may be replanted with eelgrass to facilitate re-colonization.

Wildlife

Temporary impacts associated with construction activities, such as loss of habitat or increased turbidity which may cause increased sediment suspension, may impact the American peregrine falcon, double-crested cormorant, chinook salmon, steelhead, green sturgeon, seals, and longfin smelt. A summary of mitigation measures for special status species is provided following the impact discussion.

American Peregrine Falcon. Construction activities for any build alternative may cause temporary impacts to the peregrine falcons during their reproductive cycle. A peregrine falcon pair nests on the existing East Span at Column E2. Construction activities on the existing East Span could induce defensive reactions by the peregrine falcons during the nesting season. Defensive reactions can adversely impact breeding success by jeopardizing egg laying and rearing and therefore result in wasted reproductive efforts.

Double-crested Cormorant. Work at Columns E5 through E15 along the East Span may impact the double-crested cormorant colony nesting on the bridge. Nesting activities may occur at any time within the breeding season between March and September. Construction work during this time period could disrupt some or all of the nesting or attempted-nesting activities.

Western Gull. Construction activities for the retrofit alternative or a replacement alternative could impact breeding and nesting of this species.

California Least Tern. This species is not known to occur in the project area. However, new information has become available since concluding the endangered species consultation process with USFWS for the East Span Project; this information suggests the least tern may use former Oakland Army Base lands adjacent to the project area and portions of the southern shore of the Oakland Touchdown. If portions of the southern shore of the Oakland Touchdown are needed for project construction staging, it would temporarily impact habitat that may be used by the California least tern.

Black-crowned Night Heron, Allen's Hummingbird, White-tailed Kite, Bank Swallow, and Bewick's Wren. Vegetation and tree removal on YBI may impact nesting on YBI.

Shorebirds. Sand flats would be temporarily impacted during construction of a replacement alternative. As a result, there would be a reduction in roosting and feeding habitat for shorebirds. In addition, a small portion of upland habitat located on the south side of the Oakland Touchdown could be temporarily impacted during construction of any of the build alternatives. The area could be used for construction staging. If this occurs, winter roosting and high-tide habitat would be displaced. Caltrans is investigating the feasibility of using this area for construction staging.

Harbor Seal and California Sea Lion. All build alternatives would include pile driving activities that could disturb marine mammals. Noise from pile driving activities may disturb the harbor seals when they are foraging in the waters east of YBI. The haul-out site on the south side of YBI is not used for pupping. It is possible that harbor seals swimming in the project vicinity may be exposed to elevated underwater sound pressure levels (generally 180-190 decibels [dB] or higher), which could produce temporary hearing loss and behavioral impacts (discussed below). Data obtained from a Pile Installation Demonstration Project (PIDP), completed in December 2000, has provided additional information on sound pressure levels produced by pile driving. Initial results indicate no impacts to harbor seals at the YBI haul-out site and minimal impacts to marine mammals at the PIDP site. The final results will be used to refine appropriate mitigation measures.

NMFS considers in-air noise levels below 85 dB to be safe for marine mammals. Marine mammals who have their heads above water at locations close to the pile driving activities may be affected by elevated noise levels. Potential impacts would be similar to those for high underwater sound pressure levels (temporary hearing loss and changes to behavioral patterns).

Behavioral responses of harbor seals and sea lions to noise can range from something as innocuous as a seal raising or turning its head, to permanent abandonment of an area. Noise may elicit short-term disruptions of normal activities, startle responses, agitation, and stress. Existing evidence shows that most marine mammals tend to avoid loud noises. Marine mammals in the water in the project vicinity would be

temporarily displaced if they choose to avoid the area in response to high sound pressure levels.

Gray Whale. Noise from the pile driving activities may disturb gray whales passing through the shipping channel on their way to the southern San Bruno Shoals region. It is possible that gray whales swimming in the project vicinity may be exposed to elevated underwater sound pressure levels which may impact their behavior. Whales are sensitive to high-frequency noises, which are typically not caused by pile driving. It is likely that whales would avoid the pile driving area during the short duration in which they are observed in the Central Bay (typically December to March). Gray whales foraging in the Richardson Bay area are not likely to be impacted because of the distance from the construction site.

Winter-run, Spring-run, and Fall-run Chinook Salmon. Increased turbidity from construction activities such as dredging, pile driving, barge maneuvering, and cofferdam construction could disrupt the runs of Sacramento Valley and Central Valley chinook salmon Ecologically Sensitive Units (ESUs). Adverse impacts to critical habitat for chinook salmon are not expected since the designated critical habitat is located north of the bridge. There is also the potential for adverse impacts from elevated sound pressure levels generated by pile driving.

Steelhead. Migration periods for both the Central Valley steelhead and Central Coast steelhead are similar to that of the chinook salmon. Potential impacts to steelhead are expected to be similar to those for chinook salmon.

Green Sturgeon. Increased turbidity from construction activities associated with any of the build alternatives, such as dredging, may adversely impact this species. Although adult sturgeon may be present in the Bay all year, more sensitive periods occur when juveniles are present during the winter and spring months.

Longfin Smelt. This species is not generally present within the project area, due to the relative high saline conditions. However, if longfin smelt are present in the area during construction, they may be also impacted by increased turbidity.

Pacific Herring. Increased turbidity could adversely impact Pacific herring, a commercially and recreationally important species which spawns in the Bay. The herring attach their eggs to eelgrass, seaweed, pilings, and riprap. If dredging occurs during peak spawning season (January through March), eggs in the project area could be impacted.

Fish (In General). Pile driving during construction may have impacts on fish within the immediate vicinity. Impacts on fish from driving large piles in the Bay are not well documented. During the PIDP, injury and mortality of small fish (including anchovies, herring, and perch) were observed within the immediate vicinity of unattenuated pile driving operations.

Mitigation:

American Peregrine Falcon. , Caltrans and the USFWS have developed mitigation approaches to avoid impacts to the American peregrine falcon. Mitigation includes continuation of the monitoring and release efforts by SCPBRG as described in Section 4.9.6 — Natural Resources, Mitigation. If construction activities disturb nesting activities, the monitors would collect the eggs and/or capture and release any chicks present to a natural off-site location. These measures would apply even though the falcon has been delisted because this species is protected under the Migratory Bird Treaty Act and the California Endangered Species Act.

Double-crested Cormorant and Western Gull. Caltrans would monitor the double-crested cormorant colony during breeding season and prevent the birds from nesting on the existing bridge where potential impacts by construction activities could occur. The protocol to prevent double-crested cormorants from nesting would follow the methods implemented for maintenance activities on the existing bridge. This protocol involves washing partially constructed nests off the bridge with water when the nests are not actively occupied. If the nests are completed and the birds have laid eggs, the nests would not be disturbed. Similar measures would be used to prevent western gulls from nesting.

After construction activities for the Retrofit Existing Structure Alternative are complete, double-crested cormorants would most likely recolonize the same area on the existing bridge structure.

Black-crowned Night Heron, Allen's Hummingbird, White-tailed Kite, Bank Swallow, and Bewick's Wren. Prior to the removal of vegetation and trees during construction of any build alternative on YBI, a biological monitor would survey for nests. Any vegetation or trees with nests or those adjacent to areas with nests would not be removed until the nesting period is complete. Alternatively, to the extent feasible, vegetation and trees that need to be removed could be removed prior to the nesting season (after surveys have been conducted), so as to not affect the construction schedule. Nesting for these species usually occurs between January and July.

Shorebirds. Mitigation for the temporary loss of shorebird roosting habitat as a result of any build alternative would include enhancement or creation of upland refugia as part of creation of the tidal marsh ecosystem as described in Section 4.9.6 — Natural Resources, Mitigation.

Harbor Seal, California Sea Lion, and Gray Whale. The SFOBB Pile Installation Demonstration Project tested the effectiveness of two sound attenuation systems (a bubble curtain and a floating barrier with a contained aerating mechanism) to attenuate underwater sound pressure levels generated by pile driving. Results of the PIDP suggest that the sound attenuation devices tested reduce the sound pressure levels in the vicinity of pile driving activities. Methods, such as a sound attenuation system and/or monitoring, would be used to avoid or minimize impacts to marine

mammals. The decision as to what measures to implement will be made in consultation with the NMFS.

Winter-run, Fall-run, and Spring-run Chinook Salmon, Steelhead, Green Sturgeon, and Longfin Smelt. Caltrans would implement a turbidity control program, which may possibly include turbidity curtains, to avoid and minimize impacts to critical habitat for chinook salmon and other fish. If construction sequencing permits, dredging would be avoided in shallow water during the peak juvenile outmigration period (January 1 through May 31). In addition, pile driving would be scheduled whenever possible to occur outside the peak juvenile outmigration period.

Pacific Herring. Construction activities that occur during the peak herring spawning season, generally January to March, would be monitored by a qualified biologist to watch for the presence of spawning herring. If the biologist (or CDFG) observes spawning in the project area, in-water construction activities such as pile driving and dredging would be suspended within 200 meters (660 feet) of observed spawn. In-water construction activities would not resume at that location for a period of up to 14 days (as determined by a qualified biologist), allowing herring eggs to hatch and larvae to disperse. In addition, the use of a turbidity control program, which may include turbidity curtains during dredging, would reduce the impacts of turbidity on the herring spawn.

Fish. The Biological Opinion from the National Marine Fisheries Service (NMFS) pursuant to the Federal Endangered Species Act states, "Pile driving activities will occur outside of the peak juvenile (salmonid) outmigration period of January 1 through May 31. Should construction extend past this construction window, noise insulation devices will be installed to reduce sound pressure and impulse levels." (See NMFS correspondence, September 24, 1999, in Appendix G.) While the results of the PIDP have not been finalized, preliminary results indicate that use of noise attenuation devices reduces impacts to small fish near pile driving. Caltrans will continue coordinating with NMFS regarding interpretation of the PIDP results. In compliance with NMFS' Biological Opinion, Caltrans will require that attenuation measures be used for any pile driving during the peak juvenile salmonid outmigration period, which would protect non-salmonid species as well.

4.14.9 Historic and Cultural Resources

Construction impacts on cultural resources are discussed along with permanent impacts in Section 4.10 — Historic and Cultural Resources.

4.14.10 Construction Excavation and Dredging

Each of the build alternatives would require excavation on land and dredging in water to retrofit existing, or place new, columns and to allow access to construction sites.

Dredging techniques can generally be categorized as either hydraulic (suction) or mechanical. Hydraulic dredging may involve the use of equipment such as cutterheads, dustpans, hoppers, hydraulic pipelines, and plain suction. The hydraulic

technique typically minimizes disturbance and resuspension of sediments, but involves the entrainment of high volumes of water. The water and sediments would have to be discharged at a disposal location. Mechanical techniques involve the removal of material by equipment such as clamshell (open and closed bucket), dipper, or ladder dredges. Sediments are dislodged and excavated and then raised to the surface and discharged into a barge or scow. Caltrans is still investigating dredging techniques. Factors that will be taken into consideration include cost, feasibility, and minimization of turbidity.

It is the goal that the majority of dredged materials generated by the project would be beneficially reused at upland wetland restoration sites, if such sites are available and are cost-effective. In addition, portions of the barge access channel would be restored after construction for eelgrass habitat using dredged material and excavated sand from the sand flats, resulting in a beneficial reuse. Some dredged materials could be disposed of at approved in-Bay or deep ocean disposal sites. If sites (upland wetland reuse, in-Bay, or ocean) are not available for use or are not cost-effective, Caltrans may opt to beneficially reuse all dredged materials at landfill sites as daily cover.

Materials not suitable for wetland reuse or aquatic disposal would be taken to an appropriate upland landfill. A Dredged Material Management Plan (DMMP) was prepared for the project and is included as Appendix M. This plan assesses impacts from dredging activities associated with construction and evaluates a range of reuse/disposal options for the dredged material. Since publication of the DMMP in June 1999, estimated dredged quantities were further refined. An errata sheet explaining the changes is attached to the DMMP in Appendix M. Updated information in regard to quantities and impacts is also presented in this FEIS.

Anticipated construction scenarios for the build alternatives are discussed in Section 2.6. Excavation requirements of the alternatives are presented below. Impacts to environmental resources as a result of dredging activities and related mitigation measures are discussed within each specific resource discussion and not in this section. Information can also be found in the DMMP.

Retrofit Existing Structure Alternative

Bridge retrofit would require excavation of materials on YBI and in-Bay. Upland work would consist of excavation to expand and encase existing columns on YBI in concrete. Excavated materials on YBI would include soils and rock. These materials would be disposed of at a regulated landfill or used on-site as backfill, if possible.

In-Bay construction work for the Retrofit Existing Structure Alternative would require the construction of cofferdams at each existing and new pier. Dredging would be required in shallow water to create an access channel for barges. Cofferdam dredging would not be required as access dredging in the area of the cofferdams would provide adequate excavation. Estimated excavation quantities for the Retrofit Existing Structure Alternative are presented in Table 4.14-4.

Table 4.14-4 Dredging Quantities

ALTERNATIVE	ACTIVITY									
	Construction Barge Access		Construction of New Piers and Footings		Dismantling Barge Access		Removal of Existing Piers		Total Dredged Volume	
	Volume (m^3)	Volume ($yards^3$)	Volume (m^3)	Volume ($yards^3$)	Volume (m^3)	Volume ($yards^3$)	Volume (m^3)	Volume ($yards^3$)	Volume (m^3)	Volume ($yards^3$)
Replacement Alternative N-6 (Preferred)	153,000	200,000	128,000	168,000	116,000	152,000	16,000	21,000	413,000	540,000
Replacement Alternative N-2	153,000	200,000	128,000	168,000	116,000	152,000	16,000	21,000	413,000	540,000
Replacement Alternative S-4	210,000	275,000	75,000	98,000	116,000	152,000	16,000	21,000	417,000	545,000
Retrofit Existing Structure Alternative	116,000	152,000	—	—	—	—	—	—	116,000	152,000

Source: Caltrans, November 2000.

Construction scenarios for the retrofit alternative would permit work in shallow water areas to take place from temporary construction trestles, shallow-draft barges, or conventional barges. Construction trestles could be constructed along both sides of the existing East Span from the Oakland Touchdown area westward until water depths allow for standard barge access, a minimum draft of 4.3 meters (14 feet) below mean sea level (MSL). The use of conventional barges instead of trestles would require dredging in the shallow water at the Oakland Touchdown area to 4.3 meters (14 feet) MSL. If dredging were to occur, it would be along the western edge of the Oakland Touchdown area only and would not encroach into the eelgrass or sand flat areas near the northern shore. Shallow-draft barges could also require dredging for access, depending on the type of barge selected and the nature of the construction activity.

Replacement Alternatives N-2, N-6 (Preferred), and S-4

As described in Section 2.6 — Construction Activities, construction of the replacement alternatives would require excavation of materials on YBI, the Oakland Touchdown area, and in-Bay. Upland work would consist of excavation to place footings for columns on YBI and the Oakland Touchdown, to place engineered fill and key in the rock slope protection at the Oakland Touchdown for the westbound roadway. Excavated materials on YBI would include soils and rock. These materials would be disposed of at a regulated landfill or used on-site as backfill, if possible.

Excavation at the Oakland Touchdown area would be required to place columns to support the structures as they come to grade. Soils excavated at the touchdown would be disposed of at off-site locations. Some of the soils may contain hazardous materials and would require disposal at approved upland sites.

Anticipated construction techniques for replacement alternatives would require the use of large-scale construction equipment such as pile drivers and cranes mounted on barges. These barges typically require a minimum draft of 4.3 meters (14 feet) MSL, which would require dredging in shallow water. This minimum draft includes a 0.6-meter (2-foot) additional depth to avoid the need for maintenance dredging over the five-year construction period and to provide a conservative estimate of potential total dredged material quantities. Where water depths are less than minimum barge draft, work could also be conducted from trestles near the Oakland shore, but access dredging would still be necessary. The width of the barge access channel would be 50 meters (165 feet). The access channel adjacent to the Oakland Touchdown would be reduced to a 3.7-meter (12-foot) depth and the width of the channel narrowed to 45 meters (150 feet) to minimize the impacts of dredging on special aquatic sites (see Section 4.14.8 — Temporary Impacts During Construction, Natural Resources). Anticipated dredge volumes for barge access are presented in Table 4.14-4.

In-Bay work to dismantle the existing East Span would require excavation to remove existing bridge piers. Cofferdams could be constructed at each pier to remove pile caps, piers, and footings below the existing mudline. Different approaches to pier removal are under consideration. One approach would use standard-draft barges similar to those proposed to construct replacement alternatives. This would require access dredging on one side of the existing East Span to allow barge access. Sections of the existing bridge would be lowered into barges for removal to onshore

sites for further dismantling. Estimated excavation volumes for removal of the existing East Span are summarized in Table 4.14-4.

Volumes of dredged material would be generated throughout the construction and dismantling activities. Most of the volumes, however, would be generated during three periods:

- Dredging the barge access channel for the skyway portion;
- Dredging the barge access channel for the Oakland approach;
- Dredging the barge access channel for the suspension span at YBI (Replacement Alternative S-4 only); and
- Dredging related to dismantling the existing bridge.

Figure 4-23 in Appendix A shows anticipated monthly volumes over the course of new bridge construction and dismantling of the existing bridge. Approximately 97,000 cubic meters (127,000 cubic yards) would be dredged between months 2 and 7 for construction barge access. Volumes would drop between months 8 to 21 to about 7,400 cubic meters (9,600 cubic yards) per month when only sediment removal for pier construction for the skyway and main span would be occurring. Volumes would increase in months 22-24 as construction access for the Oakland approach would be conducted as well as some excavation for piers. Limited (approximately 460 cubic meters [600 cubic yards]) dredging would occur for pier construction during months 25-50. This volume amounts to less than one full barge trip per month. No sediment removal is anticipated between months 51 and 60.

As dismantling the existing bridge begins, approximately 116,000 cubic meters (152,000 cubic yards) would be dredged for creation of the barge access channel (months 41 to 72). Volumes during this time frame would be approximately 1,300 cubic meters (1,700 cubic yards) per month of sediment dredged to remove existing bridge footings and piles.

Reuse/Disposal of Excavated and Dredged Material

Some excavated upland soils from YBI and the Oakland Touchdown are expected to be contaminated and would require disposal at an approved upland disposal site.

A range of 36 potential in-Bay, ocean, and upland/wetland reuse sites listed in the 1998 San Francisco Bay Conservation and Development Commission (BCDC) Roadmap[16] were initially considered in the DMMP. These sites were screened based on availability of the sites during the East Span Project construction time span (e.g., would the site be permitted and accepting dredged material by mid-2001) and the capability of the site to receive the volumes and type of material generated. Most of the sites considered were either reserved strictly for specific projects (e.g., federal channel maintenance dredging) or were planned but would not likely have environmental permits needed prior to the start of the East Span Project dredging activities.

[16] The Roadmap is a compilation of existing and planned sites identified by BCDC and the U.S. Army Corps of Engineers that can potentially accommodate current and potential dredged Bay materials.

The above assessment narrowed the list of potential in-Bay, ocean, and upland/wetland reuse sites candidates to four practicable candidates: 1) Alcatraz (SF-11); 2) the San Francisco Deep Ocean Disposal Site (SF-DODS); 3) the Hamilton Wetlands Restoration Project; and 4) the Montezuma Wetlands Restoration Project (Figure 4-1 in the DMMP [Appendix M]). These sites are already permitted or may be permitted by the start of dredging activities for the East Span Project. In addition to these sites, upland disposal at a landfill and sidecasting of the material (dredging and placing the material immediately to the side of the dredged channel) were also considered. Each of these options was evaluated in terms of affected environment, implementability of the option, environmental impacts, and economic factors. These are discussed in detail in the DMMP (Appendix M). Since publication of the DMMP, another beneficial reuse has been considered. As part of the on-site mitigation for special aquatic sites, Caltrans is proposing to restore up to approximately 0.7 hectare (1.7 acres) of the barge access channel with stockpiled dredged material and excavated sand to facilitate eelgrass colonization.

In determining the preferred reuse/disposal option, several criteria were used in the decision-making process. These included:

- **Impact of Reuse/Disposal Option on Project Schedule —** Can the site accept the quantities of material as they will be generated (i.e., larger quantities at the beginning of construction and dismantling activities, with smaller quantities in the intervening months)?

- **Reliability of the Site —** Will the site be permitted and operational in time to accept dredged material?

- **Consistency with the Goals of the Long-Term Management Strategy (LTMS) —** In general, the goals of the LTMS are to use most dredged material for upland wetland reuse with ocean disposal as a "relief valve". In-Bay disposal would be reduced over time to a smaller percentage of total dredged materials.

- **Consistency with Individual Permitting Requirements —** Can the option be permitted by the various permitting agencies including the ACOE, BCDC, and the San Francisco Bay Regional Water Quality Control Board (RWQCB)?

- **Suitability for Wetland Reuse or Aquatic Disposal —** Sediment testing was conducted in November 1996 for the Retrofit Existing Structure Alternative and in June 2000 for Replacement Alternative N-6 (Preferred). The results of the testing indicate suitability of most of the material for wetland reuse or unconfined aquatic disposal. Testing of the barge access channel for dismantling would be done in the future, as requested by the DMMO.

- **Environmental Impacts —** Biological, water quality, and air quality impacts were the focus of the impact analysis.

- **Costs —** Costs for use of each of the sites included transportation costs, number of barge trips, distance, volume of material, tipping fees for site use, monitoring costs, etc.

Table 7-1 of the DMMP (Appendix M) provides a comparison of the various sites based on the above criteria. The comparative evaluation suggested that no single reuse/disposal option was preferred for all dredged materials generated by the East Span Project, given the differences in capacity, suitability, costs, and logistics. In general, environmental impacts at the reuse/disposal sites were not an important factor because they were already mitigated at the reuse/disposal sites as part of the site design (e.g., Hamilton, Montezuma, landfills) or are kept to minimal levels through volume and seasonal restrictions on disposal (SF-11, SF-DODS). The results of the DMMP indicated that reuse of the sediment for upland wetland creation would have beneficial impacts. Sidecasting was the only option considered in the DMMP that could have potentially substantial environmental impacts. Caltrans does not propose to sidecast any of the dredged material.

Preferred Reuse/Disposal Option

The preferred reuse/disposal option outlined in the DMMP (Appendix M) would be to beneficially reuse the majority of the material at an available upland wetland restoration site, if such a site is available and cost-effective. If approved sites are not available, Caltrans may beneficially reuse materials at landfill sites as daily cover or dispose of materials at the deep ocean disposal site. Caltrans also plans on beneficially reusing some dredged material and excavated sand to restore a portion of the barge access channel at the Oakland Touchdown to facilitate eelgrass colonization. A much smaller amount of material is proposed for disposal at the Alcatraz site. This would consist of small quantities of material (approximately 460 cubic meters [600 cubic yards]) that would be generated on a monthly basis during pier construction. This option is being proposed due to the logistics of transporting and disposing of small monthly loads. Dredged material determined to be unsuitable for aquatic disposal or wetland reuse would be taken to an appropriate landfill for disposal. Determination of the suitability of material during construction would be based on the results of the sediment sampling and analysis described in Section 3.12.2. The Sediment Sampling and Analysis Report (available for review at Caltrans District 4 offices) presents testing results at multiple locations along the Preferred Alternative alignment. The DMMO reviewed this report and its conclusions in regard to the suitability of dredged materials for unconfined disposal are presented in Section 3.12.2. A copy of its October 31, 2000, letter is presented in Appendix G. The disposal goals for the project are consistent with the goals of the LTMS.

Aquatic disposal of excavated materials would require permits and approvals from federal, state, and regional permitting agencies. Caltrans has consulted with agencies, including the ACOE, BCDC, RWQCB, U.S. Fish and Wildlife Service (USFWS), EPA, California Department of Fish and Game (CDFG), and California Department of Toxic Substance Control (DTSC), regarding applicable permits and approvals to dispose of materials at specified sites.

4.15 CUMULATIVE IMPACTS

East Span Project build alternatives would contribute to both beneficial and negative cumulative impacts. Although all East Span Project build alternatives would be expected to contribute to cumulative impacts, the Retrofit Existing Structure Alternative would have fewer negative cumulative impacts than the replacement alternatives. This is due primarily to the increased construction footprint of the replacement alternatives.

The cumulative impacts analysis determined that some temporary cumulative impacts would result from construction activities. Temporary impacts caused by the construction of the East Span Project occurring simultaneously with impacts resulting from construction of other projects were combined to evaluate whether there are temporary cumulative impacts. Resource categories that would experience temporary cumulative impacts are land use, traffic, air and water quality, special status species, and energy consumption. Long-term cumulative impacts of the East Span Project replacement alternatives in combination with other projects would occur in the resource categories of land use, Bay fill, special aquatic sites, other natural communities, and archaeological resources. The East Span Project replacement alternatives would contribute to beneficial cumulative impacts in the resource categories of non-motorized transportation, long-term visual changes, and dredge material reuse/disposal.

4.15.1 Regulatory Framework

NEPA regulations developed by the Federal Council on Environmental Quality (CEQ) require that the cumulative impacts of a proposed project be addressed in an EIS (40 CFR Section 1508.25). Cumulative impacts on the environment are those that result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions (40 CFR Section 1508.7). These impacts can result from individually minor impacts of multiple actions over time.[17]

4.15.2 Methodology and Format

This cumulative analysis considers past, present, and reasonably foreseeable future projects that involve impacts to the same resource categories as those impacted by the East Span Project. Since eight commenters (EPA, ACOE, California Preservation Society, National Trust for Historic Preservation, Earth Island Institute, BART, City of Oakland Planning Department, and Save San Francisco Bay Association) commented on the Draft EIS cumulative impacts analysis, the entire cumulative impacts analysis has been updated and expanded.

The analysis addresses impact categories of a regional nature, such as natural resources, by consideration of actions that may result from the implementation of plans by regional agencies that manage or regulate potentially impacted resources. Regional plans consulted in this assessment include the Regional Transportation Plan (RTP), the Transportation Improvement Program (TIP), BCDC Bay Plan and Seaport

[17] Council On Environmental Quality Executive Office of the President, Considering Cumulative Effects Under the National Environmental Policy Act, January 1997, pg. 1. The terms "effect" and "impact" are used interchangeably in this section (40 CFR 1508.8).

Plan, the Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region (LTMS), the Baylands Ecosystem Habitat Goals Report, the State Implementation Plan for attaining air quality goals and the San Francisco Bay Regional Water Quality Control Board Basin Plan. Other known agency-sponsored or reviewed projects undertaken or planned that may not be included in these plans have also been addressed in this analysis. These projects are identified for each subject area.

Impact categories, such as land use, which are discussed at the local geographic level, are addressed in this cumulative analysis by consideration of the plans and projects being implemented by Caltrans, the City of Oakland, the City and County of San Francisco, and the East Bay Regional Park District. Recent projects and local development plans of the Port of Oakland, Port of San Francisco, Port of Richmond, and San Francisco International Airport are also incorporated into the analysis.

Regulatory and Geographic Context

The examination of each environmental resource category begins with a discussion of regulatory and geographic context. Regulatory context refers to the legal framework within which each environmental resource category is governed. For example, Section 404 of the federal Clean Water Act protects special aquatic sites such as wetlands, eelgrass, and sand flats. The cumulative impacts of the East Span Project and other actions are discussed in the context of policy requirements for no-net-loss of these protected resources. The geographic context varies by environmental resource category. For example, resource discussions such as dredging address geographically large areas because cumulative impacts are most accurately understood in the context of San Francisco Bay and not by jurisdictional boundaries of governmental entities. In the Bay Area, planning for dredged material disposal and reuse is taking place at a Bay-wide or regional level; therefore, the cumulative impacts are considered at a regional level.

The potential for cumulative impacts on some environmental issues such as land use are evaluated in a local geographic context. A local context applies to land use and transportation issues because the East Span Project would not change traffic capacity that could potentially alter regional land use planning decisions.

Trends for historical patterns of resource use are described for each resource category. A review of these trends provides context for the impacts analysis because there is limited information available about specific past projects that can be analyzed in consideration of other past, present, and future actions. For example, the trend for air quality in the Bay Area is based on reductions in pollutant emissions since passage of the federal Clean Air Act.

Past actions for each environmental resource are included in the description of context.

Because the goal of the cumulative analysis is to consider how the East Span Project, in combination with past, present, and reasonably foreseeable future actions cumulatively affects the resources, understanding trends in the stability, use, or viability of the resource over time is relevant. The timeframe in which each resource is

examined is determined by the availability and relevance of "the best data we have or are able to collect" with regard to other projects and environmental trends for the resource (CEQ 1997). The timeframe for construction-period impacts is generally considered to be the construction timeframe for the East Span Project.

The discussion of each environmental resource category also provides a brief summary of the East Span Project's impact and a reference to other sections of the EIS where the resource is described and the impact assessment is reported.

4.15.3 Land Use

Context

The regulatory context for examining cumulative land use impacts is at the local and regional planning levels. Comprehensive plans and redevelopment plans of the cities of San Francisco and Oakland set policies for current and future development within and around the project limits. Regional plans such as the BCDC Bay and Seaport Plans have been factors in recent planning actions and will influence future redevelopment decisions. The geographical context for land use is Yerba Buena Island (YBI) and the Oakland Touchdown area; the geographic context is also defined by the physical structure of the bridge which has influenced past land use decisions and may affect existing and future land uses (see Section 4.1.5 — Community Impacts, Development Trends). These regulatory and geographic contexts are based on the fact that the East Span Project would maintain the current traffic capacity of the SFOBB and, therefore, would not induce any new development growth nor would the East Span Project increase access, which could support more intense development.

Available planning documents and policies were considered to assess potential impacts of future projects over an approximately 20-year planning horizon. Future projects are the adopted or pending land use planning decisions for residential and mixed-use development on the YBI property anticipated to be released to the CCSF by the Navy and described in the Draft Naval Station Treasure Island Reuse Plan (1996 Draft Reuse Plan) and potential expansion of USCG facilities on YBI. Future projects at the Oakland Touchdown area are a proposed public park at the southwestern end of the Oakland Touchdown area as well as other development identified in the Draft Oakland Base Reuse Plan.

Yerba Buena Island. YBI has been owned by the U.S. government since 1868. The flat areas of the island have been developed for military uses since that time. Other than Building 213, Navy-owned buildings located on the flat portions of YBI have been removed. YBI was under the control of the U.S. Army from 1868 to 1897, at which time it was transferred to the U.S. Navy for use as a training station. Soon after the transfer, Congress made an appropriation to establish a Naval Training Station for apprentices on the Pacific Coast; during World War I, there were as many as 13,000 men training on the island.

In 1872, a USCG predecessor agency, the Lighthouse Service, was established on 12 hectares (29 acres) of YBI. A signal station and buoy depot were built and the lighthouse was constructed in 1875. When the Bureau of Lighthouses and the USCG

merged in 1939, the USCG was given control of the 12 hectares (29 acres). In 1973, the radar facilities and control center of the USCG Vessel Traffic Service San Francisco were moved to YBI from Fort Mason in San Francisco.

Presently, the USCG conducts search and rescue missions; it also operates a buoy repair and navigation control center facility on YBI. It now encompasses approximately 17 hectares (41 acres). The Navy holds title to most of the remaining land on the island and is working with the CCSF to transfer the land to it through the Base Realignment and Closure (BRAC) process. Approximately 8 hectares (20 acres) of Navy land were recently transferred to Caltrans as permanent right-of-way for all alternatives under consideration, another 31 hectares (77 acres) were transferred for temporary construction easements. Of these 31 hectares (77 acres), 11 hectares (26 acres) are land and the remainder consists of former Navy waters surrounding Yerba Buena Island.

Sections 3.1.1 — Existing Land Uses in the Project Vicinity and 3.1.2 — Developable Land and Development Trends, Yerba Buena Island and Treasure Island further discuss existing and proposed land uses on YBI.

The SFOBB opened in 1936 and provided road access to the island. The adjacent Treasure Island (TI) was partly created from the materials excavated for the tunnel on YBI. TI was the site for the 1939-40 Golden Gate International Exposition.

The Navy and CCSF planning processes will influence future land use on the Navy-controlled portion of YBI. The CCSF prepared a 1996 Draft Reuse Plan that includes several scenarios of residential and mixed-use development on YBI (see 3.1.2 — Developable Land and Development Trends, Yerba Buena Island and Treasure Island). In addition, local land use will be influenced by BCDC's Bay Plan, which states "If and when not needed by Navy or Coast Guard; redevelop released areas for recreational use." Implementation of the CCSF's Draft Reuse Plan would require an amendment to the Bay Plan, to delete YBI's designation as a park priority use.

Oakland Touchdown Area. The Oakland Touchdown area considered in this analysis is the portion of the peninsula west of the SFOBB Toll Plaza (see Figure 2-2 in Appendix A). The Oakland Touchdown area is a manmade peninsula that has expanded over time to serve transbay transportation facilities. Since the late 1880s land uses on the Oakland Touchdown have generally been for transportation purposes and later for military functions. It was the east end of the Key System pier, which connected the East Bay rail transit system to the Key System ferry terminal. In 1936, the peninsula was widened to the north for the bridge approach and toll plaza of the SFOBB. Existing land uses on the Oakland Touchdown area include an EBMUD dechlorination facility; the existing bridge and Caltrans maintenance facilities; industrial, maritime, transportation, and commercial activities related to the Port of Oakland; and a Resource Conservation area designated in the City of Oakland's General Plan. Future trends are the same except for the conversion of 6 hectares (14.7 acres) of military land at the western end of the Oakland Touchdown area to park use. The affected environment of the Oakland Touchdown area is also discussed in

Sections 3.1.1 — Existing Land Uses in the Project Vicinity and 3.1.2 — Developable Land and Development Trends.

Future land uses at the Oakland Touchdown area are the subject of current land use planning efforts by federal, state, and local agencies. The majority of this area was designated as a "port priority use area" in the April 1996 San Francisco Bay Seaport Plan Update, issued jointly by BCDC and MTC, and the BCDC San Francisco Bay Plan. This area is known as the Bay Bridge site. In addition, the Oakland Base Reuse Authority (OBRA) has designated a 6-hectare (14.7-acre) parcel, formerly part of the Oakland Army Base, as a future park. Amendments to the OBRA Draft Final Reuse Plan have been initiated with the goal of preserving the Port's space requirements to meet future operational needs. BCDC recently deleted the Oakland Touchdown area as a port priority use from its Seaport and Bay Plans. The use of the Oakland Touchdown area is now the responsibility of the local government, the City of Oakland. BCDC can now approve any use of the site as long as it is consistent with BCDC's permitting authority to ensure maximum feasible public access consistent with the proposed project and to minimize Bay fill.

The Resource Conversation Area designated in the Oakland General Plan includes landscaped uplands, sand flats, sand dunes, and tidal marshes along the north shore of the Oakland Touchdown and to the east and north of the project limits. The trend for these areas is their conservation and enhancement. Areas within the Emeryville Crescent to the east of the East Span Project limits have been incorporated into the East Shore State Park that is being planned and developed by the East Bay Regional Park District. A master planning process for the East Shore State Park was initiated in late 2000 and is expected to be completed in approximately two years. It is expected that the areas along the north shore of the Oakland Touchdown area would continue in their current use as landscaped uplands, sand flats, sand dunes, and tidal marshes with limited public access.

Impacts Analysis

Yerba Buena Island. Project impacts to land use on YBI are described in Section 4.1 — Community Impacts. Other, and greater, impacts on land uses on YBI would result from the planned transfer of the Navy-owned land to CCSF and any changes resulting from USCG planning.

With regard to land on YBI under jurisdiction of the USCG, the East Span Project impacts range from no impact under the Retrofit Existing Structure Alternative to the removal of four existing buildings, reconfiguration of the existing main facility access gate, and placement of columns supporting the new structure under Replacement Alternative S-4. More intense development could result from future redevelopment of the facility by the USCG. However, at this time, no specific master plan has been developed for expansion of the existing USCG facility because USCG delayed final master plan preparation pending outcome of the TI BRAC process and final design for the East Span Project. While the USCG facility does have undeveloped areas, it cannot be determined at this time what changes to land use might occur.

With regard to land to be redeveloped by the CCSF under the 1996 Draft Reuse Plan, many changes to existing land use are anticipated. Under the 1996 Draft Reuse Plan, developed through the BRAC process, more intensive development of live/work cottages and loft spaces, a conference center and potential commercial redevelopment of Building 262 at the easternmost point of YBI are planned.

The existing access to YBI provided by the SFOBB is an integral part of all reasonably foreseeable land use plans for the island. The USCG facility could continue to operate and the proposed land uses discussed in the 1996 Draft Reuse Plan could be implemented with any of the East Span Project alternatives. The East Span Project is not expected to influence land use decisions by the CCSF, although permitting authority of BCDC, market factors, and environmental resources may influence ultimate land use patterns. Reasonably foreseeable development plans of the USCG cannot be assessed. The implementation of both the East Span Project and the 1996 Draft Reuse Plan would increase the density of development on YBI compared to present conditions. The potential increase in density resulting from CCSF-sponsored redevelopment combined with the increased number of columns for the SFOBB on YBI would result in a cumulative impact on land use.

Oakland Touchdown Area. Since the late 1800s, land uses at the Oakland Touchdown area have been transportation and military. Since 1936, the Oakland Touchdown has accommodated the existing bridge approaches, the SFOBB Toll Plaza, and bridge maintenance facilities. The East Span Project alternatives would continue this pattern of development and therefore would not cumulatively influence land use at the Oakland Touchdown area. The other foreseeable future project in this area is a proposed public park.

The Retrofit Existing Structure Alternative and Replacement Alternatives N-2 and N-6 (Preferred) would not impact existing or proposed land uses at the Oakland Touchdown area, and would accommodate the development of the proposed Gateway Park whereas the alignment of Replacement Alternative S-4 would bisect it and reduce its size by approximately one-half.

The Resource Conservation Area designated in the Oakland General Plan on the north side of the Oakland Touchdown consists of landscaped uplands, sand flats, sand dunes, and tidal marshes. The area would be impacted by Replacement Alternatives N-2 and N-6 (Preferred). Both alternatives would impact a portion of the sand flats that are on the westernmost portion of the Resource Conversation Area. The trend for the Resource Conservation Area is preservation and enhancement. The East Span Project northern replacement alternatives would reduce the total area of sand flats designated as a Resource Conservation Area, reversing the enhancement of the area. No other projects are known that would affect resource conservation areas in Oakland. A cumulative impact is not expected to occur.

Replacement Alternative S-4 would conflict with the proposed Gateway Park. However, a cumulative impact would not be expected to result from the conflict because, although Replacement Alternative S-4 would change the area and configuration of the proposed Gateway Park, both of the uses could be accommodated.

4.15.4 Transportation

Context

The regulatory context for the transportation analysis is the transportation policies and plans of federal, state, and regional agencies that oversee planning, funding and maintenance of transportation facilities crossing the San Francisco Bay. The geographic context for transportation is the Transbay Bay Bridge Corridor, which extends from the 5th Street I-80 vehicular on-ramp to the SFOBB in San Francisco to the distribution structure in Alameda County. The corridor includes proposed connections to the Bay Trail as well as the Transbay Transit Terminal in San Francisco. It also includes the north-south navigation openings beneath the existing SFOBB. The SFOBB is a regional transportation facility and is designated as an Interstate highway. Because there would be no change in the traffic capacity of the facility, the project alternatives would only influence transportation facilities within the Transbay Bay Bridge Corridor.

The Transbay Bay Bridge Corridor connects Alameda, Contra Costa, and San Francisco counties. It has been a transportation corridor since the development of an integrated system of trains and ferries in the late 1800s. The train and ferry system was followed by the SFOBB which was completed in 1936, the BART Transbay Tube in the 1960s, and re-introduction of ferry service connecting San Francisco to Oakland and Alameda in the 1980s. This past trend as a central transportation corridor for the Bay Area is anticipated to continue in the future.

The Transbay Bay Bridge Corridor includes cars, buses, and other high-occupancy vehicles (e.g., carpools and vanpools, BART, and ferries), trucks, motorcycles, boats, and bicycles that use both the Caltrans bike shuttle and BART. Transportation impacts discussed in this section are those which affect the movement of people and goods via these forms of transportation. There is an increasing demand for transportation services in the Transbay Bay Bridge Corridor. A number of actions are being studied to address the need to provide additional transportation capacity in the corridor. The Metropolitan Transportation Commission (MTC) conducted a study of potential new Bay crossings in 1991 and is currently updating it to consider how traffic operations systems, new rail services, and additional bridges crossing Central San Francisco Bay could increase transportation capacity in the corridor to address a continuing increase in demand for multi-modal transportation services.

Other trends are an expanded Bay Area ferry network and increasing demand for transbay bus service. Ferry service in the Transbay Bay Bridge Corridor includes Alameda-San Francisco and Jack London Square-San Francisco routes. A Regional Ferry Plan for the San Francisco Bay Area conducted in 1992 called for a 45 percent increase in ferry service throughout the Bay. Capital improvements to support increased service would include terminal facility upgrades and new high-speed ferries. Sources for additional funding to implement recommended service improvements have not been identified.

AC Transit provides commuter bus service in the Transbay Bay Bridge Corridor. Statistics show that ridership increased from 8,800 to 13,600 between 1996 and 1999. AC Transit conducted a CEQA environmental review of options to expand transbay bus service in 1997 and concluded that there would be no adverse impacts to such an expansion.

Pedestrian facilities are not currently provided in the Transbay Bay Bridge Corridor. Public planning sessions for the East Span Project and MTC-led studies addressing provision of a bicycle/pedestrian path on the SFOBB West Span have identified a desire for bicycle/pedestrian facilities in the Transbay Bay Bridge Corridor.

Foreseeable projects in the Transbay Bay Bridge Corridor include the West Approach Seismic Retrofit, the West Span Seismic Retrofit, the YBI Tunnel Retrofit, the West Viaduct YBI Retrofit, the distribution structure seismic retrofit, reconstruction of the SFOBB Toll Plaza, bicycle/pedestrian improvements on YBI and TI, and planned expansion of the Bay Trail. A redesign or replacement of the Transbay Transit Terminal is planned and AC Transit will install bicycle racks on transbay buses by early 2001. The 1996 Draft Reuse Plan envisions ferry service between San Francisco and Treasure Island.

Impacts Analysis

Vehicular. All build alternatives would maintain existing traffic capacity on the SFOBB and would therefore have minimal impacts on vehicular transportation.

While redevelopment on YBI and TI (see Section 4.15.3 — Land Use) could generate additional transportation demand in the Transbay Bay Bridge Corridor, the 1996 Draft Reuse Plan is based on existing bridge capacity and calls for ferry service to accommodate additional transportation demand to and from YBI and TI. Vehicular traffic from YBI and TI would be adequately accommodated by the current transportation capacity of the bridge and ramps, assuming the 1996 Draft Reuse Plan is implemented as described. Other projects affecting transbay vehicular traffic (e.g., additional bridge crossings) are too speculative to evaluate at this time.

Bicycle and Pedestrian. The Retrofit Existing Structure Alternative would not accommodate bicycles and pedestrians on the East Span, but would be consistent with planning to extend the Bay Trail to the west end of the Oakland Touchdown area. The Retrofit Existing Structure Alternative in combination with planned Bay Trail improvements would have negligible impacts on bicycle and pedestrian traffic within the Transbay Corridor.

All replacement alternatives would improve bicycle and pedestrian access along the east half of the Transbay Bay Bridge Corridor through the addition of a bicycle and pedestrian path. This path would provide a link to the future Bay Trail connection at the Oakland Touchdown area and would support the 1996 Draft Reuse Plan's encouragement of bicycle and pedestrian access and circulation on TI and YBI, assuming CCSF permits pedestrian and bicycle traffic to access YBI from the East Span Project bicycle/pedestrian path. This combination of projects would result in a cumulative expansion of bicycle and pedestrian travel opportunities on the eastern side

of the Transbay Bay Bridge Corridor and a beneficial cumulative impact on bicycle and pedestrian circulation.

Impacts on Transportation During Construction

The potential for cumulative impacts to occur in the Transbay Bay Bridge Corridor exists due to the possible overlap of construction of the East Span Project with the West Approach Seismic Retrofit, the West Span Seismic Retrofit, the YBI Tunnel Retrofit, the West Viaduct Retrofit, the distribution structure seismic retrofit, and the reconstruction of the SFOBB Toll Plaza. Potential construction-period impacts for East Span Project build alternatives are discussed in Section 4.14.2 — Transportation Impacts During Construction. In combination with Port of Oakland traffic, there would be an increase in the number of trucks that would operate on Burma Road and Maritime Street during construction of the East Span Project.

As discussed in the Section 4.14.2 — Transportation Impacts During Construction, the Retrofit Existing Structure Alternative could contribute to construction-period impacts because it would result in disruption to traffic operations on the SFOBB during lane closures. This condition would persist for much of the nearly six-year period to complete this alternative.

As discussed in Section 4.14.2, all replacement alternatives would have minimal peak-period traffic impacts on the SFOBB. These alternatives could contribute to cumulative construction-period effects as a result of off-peak period closures for the diversion of traffic onto the temporary structures and later to a replacement structure.

The Oakland Army Base Reuse Authority (OBRA) reuse plan assesses the potential traffic impacts of its draft reuse plan. The traffic analysis, projected to the year 2010, indicates that the Maritime Street/Burma Road intersection would not meet City of Oakland peak-hour traffic requirements that intersections operate at level of service (LOS) D. With implementation of the draft reuse plan, the Maritime Street/Burma Road intersection would operate at LOS E in the morning peak period and LOS D in the evening peak period. The OBRA draft reuse plan recommends improvements to the morning LOS to meet the City of Oakland's requirements. The OBRA draft reuse plan recommends that the intersection improvements be implemented in 2004.

If East Span Project construction trips on Burma Road occur during morning and evening peak periods, a cumulative traffic impact may result from East Span Project construction vehicle traffic combined with predicted future traffic generated by the implementation of the OBRA reuse plan. Typically, movement of construction vehicles and equipment is timed to avoid peak commute hours, which would reduce the potential for cumulative construction-period traffic impacts to occur in the vicinity of the Port of Oakland. Should OBRA implement intersection improvements recommended for 2004, additional intersection capacity would further reduce the potential for cumulative construction-period traffic impacts to occur in the vicinity of the Port of Oakland.

In combination with other projects in this context area, cumulative transportation impacts, such as increased congestion and travel delays primarily in off-peak travel times, could occur as a result of detours or lane closures occurring simultaneously.

However, Caltrans has successfully implemented consolidated and large-scale public information programs and transportation management plans for projects of the scale of the East Span Project and would do the same for this project. Caltrans is continuing to investigate lane and full bridge closures to transition traffic from the existing bridge to the temporary detours and to the replacement bridge. Caltrans would plan the closures in an effort to simultaneously minimize public inconvenience, facilitate construction, and maximize public safety. The closures would be scheduled to occur during off-peak hours, to the maximum extent possible. Motorists would be informed of construction activities on SFOBB seismic safety projects in the Transbay Corridor in advance through public information programs. Consequently, cumulative traffic impacts would be minimized through the traffic management plan.

4.15.5 Visual Quality

Context

The National Environmental Policy Act requires consideration of visual impacts of proposed actions. For the East Span Project, FHWA's visual quality methodology for roadway projects was used to determine the visual impacts of project alternatives (see Section 4.3 — Visual Impact Analysis). The cumulative impacts on visual quality are analyzed in the local geographic context of YBI and the Oakland Touchdown area. The project analysis presented in Section 4.3 determined that visual impacts of the project would consist of loss of vegetation on YBI and at the Oakland Touchdown area; the project would not result in visual impacts in the larger context of the San Francisco Bay Area. Therefore, the cumulative impacts analysis considers the impacts of the East Span Project in combination with other projects that may alter local visual quality either long-term or during the construction period.

In the local context, past trends in visual quality on YBI have reflected military land uses. The appearance of the island has been greatly modified by the construction of military installations, the SFOBB, and introduction of non-native ornamental vegetation. The Oakland Touchdown area was created to provide for military and transportation uses and this trend continues today. More recent trends have been conversion of portions of the former OARB at the Oakland Touchdown area to industrial uses such as cargo container storage for the Port of Oakland. The existing visual quality of the Oakland Touchdown area is low because the predominant views are of industrial uses (e.g., containerized cargo storage and Caltrans maintenance and toll collection facilities). The vegetation on the south side of the Oakland Touchdown area is generally ruderal herbaceous plants and vegetation on the north side consists mostly of pine trees and ice plant.

Other projects at the local level that could affect the visual quality on YBI include YBI development described in the 1996 Draft Reuse Plan such as new buildings. Vegetation removal to reduce fuel load on YBI proposed by the San Francisco Fire

Department may also affect visual quality. Projects in the Oakland Touchdown area include the proposed Gateway Park and reconstruction of the SFOBB Toll Plaza.

Impacts Analysis

Permanent Local Visual Impacts — Yerba Buena Island. CCSF Fire Department plans designating vegetation removal for fire fuel management were not available for review. Typically, fire fuel management focuses on reducing fuel load by removal of highly flammable trees and clearing vegetation immediately surrounding buildings.

The residential and commercial developments in the CCSF's 1996 Draft Reuse Plan could result in the removal of vegetation. It is speculative to estimate the location or amount of vegetation that would be affected. However, a redevelopment concept shown in the 1996 Draft Reuse Plan indicates preservation of the vegetation along the northeastern shoreline of YBI and the ornamental landscaping in the Senior Officers' Quarters Historic District.

The impacts of the East Span Project, the CCSF Fire Department fuel management, and the 1996 Draft Reuse Plan on vegetation would result in a cumulative visual change and some reduction of visual quality. However, because a revegetation plan for the East Span Project would include replacement of vegetation with mature vegetation as much as possible, long-term impacts to visual quality on YBI are not expected.

Permanent Local Visual Impacts — Oakland Touchdown Area. Other projects planned for the Oakland Touchdown area could result in an increase or decrease in vegetated areas. The proposed Gateway Park is not sufficiently advanced in the planning process to determine the amount and types of vegetation that might be included in the park design but it can be assumed that the park would have both landscaping and open space. Design concepts for the SFOBB Toll Plaza reconstruction are not sufficiently developed to determine impacts to pine trees near the existing facility, but this plan would probably include new landscaping. The City of Oakland's plans for the eastern portion of the Oakland Touchdown area are not yet known; however, it is reasonable to assume that both open space and landscaping would be features of future redevelopment.

Based on available information concerning projects at the Oakland Touchdown and the inclusion of a master planting plan for the SFOBB replacement alternatives, it is expected that the long-term cumulative impacts on visual quality due to changes in the amount of vegetation would be beneficial.

Construction-Period Impacts to Viewsheds at Yerba Buena Island and the Oakland Touchdown Area. In addition to clearing and grubbing operations, all build alternatives would require construction activities involving the use of barges, heavy equipment, stockpiles of soils and materials, and other visual signs of construction. Selected views may be modified temporarily during construction because of the heavy equipment and removal of portions of woodland areas.

Visual impacts of development on YBI and TI envisioned in the 1996 Draft Reuse Plan would not occur in the same timeframe as construction of the East Span Project (see Section 4.1.5 — Community Impacts, Development Trends) and therefore the East Span Project would not contribute to local cumulative temporary visual impacts.

Redevelopment planning for the Oakland Army Base must be completed prior to initiating major construction projects on the Oakland Touchdown area. Although the timing of construction is subject to a number of variables, including regulatory and market conditions, it is likely that construction within the area would occur during the seven year construction period for the SFOBB East Span Project. Consequently, motorists are likely to view construction activities associated with former Oakland Army Base redevelopment in addition to construction activities associated with construction of the SFOBB East Span Project. Due to the combined construction activities at the Oakland Touchdown area, there would be a temporary construction-period cumulative impact on visual quality.

4.15.6 Air Quality

Context

From the regulatory perspective, transportation projects, including the East Span Project, are determined to be consistent with planning for air quality if they have been included in the regional air quality emissions analysis conducted by MTC and the Bay Area Air Quality Management District for the RTP and TIP and approved by the U.S. Environmental Protection Agency (see Section 3.4.1 — Regulatory Context for a discussion of conformity regulations). The geographic context for the analysis is the San Francisco Bay Area Basin, which is under the jurisdiction of the Bay Area Air Quality Management District. Other projects considered in the analysis are those in the Transbay Bay Bridge Corridor (see Section 4.15.4 — Transportation), Port of Oakland construction activities, and other transportation projects in the region identified in the RTP and TIP.

Since the federal Clean Air Act was passed in 1970, and amended in 1977 and 1990, air quality in the Bay Area has improved. Emissions levels and ambient concentrations for most pollutants are going down in the San Francisco Bay Area Air Basin despite increases in population and vehicle miles traveled. The one pollutant that has shown an increase over the last 15 years is particulate matter. This increase is due to a growth in area-wide sources, primarily fugitive dust sources. However, smaller particulate matter (PM_{10}) concentrations, for the most part caused by combustion, are decreasing as a result of emission controls.

Implementation of the Clean Air Act Amendments of 1990, which includes stricter stationary and mobile source emission standards and controls, has contributed substantially to the decrease in air pollutant emissions. The implementation of even stricter emission controls in the future is expected to result in further improvements in air quality as stated in the 1999 California Almanac of Emissions and Air Quality issued by the California Air Resources Board.

Impacts Analysis

Air Quality Conformity. As discussed in Section 4.4 — Air Quality, there would not be a change in pollutant emissions resulting from operation of any of the build alternatives. In addition, FHWA has determined that the East Span Project is in conformance with the State Implementation Plan (SIP). (See Section 4.4.3 — Air Quality Conformity). Therefore, this project would not contribute to long-term air quality impacts.

Construction-Period Impacts. Construction-related air quality impacts resulting from this and other projects in the San Francisco Bay Area Air Basin including local projects in the Transbay Bay Bridge Corridor (see Section 4.15.4 — Transportation) and Port of Oakland construction activities could, depending on construction schedules, result in short-term cumulative air quality impacts within the Transbay Bay Bridge Corridor. Construction-period air quality impacts would include internal combustion engine emissions from construction equipment, dust generated by mechanical disturbance, and wind-blown dust from exposed soil. The pollutant usually generated in the largest amount during construction is particulate matter.

Projects that may be under construction simultaneously with the East Span Project include some of the other SFOBB improvements described in Section 1.3.6 — Other SFOBB Seismic Safety Projects. The West Approach Seismic Replacement would require structure dismantling and earthmoving activities that would cause temporary dust and particulate emissions.

Port of Oakland construction activities may also overlap with the East Span Project and be undertaken beginning in 2002 and continuing to the proposed buildout year, 2012. Construction activities could include demolition or rehabilitation of existing structures, dredging, and grading and paving of laydown areas which would increase air pollutant emissions.

The potential for cumulative impacts to occur would be minimized through inclusion of standard specifications employed by contractors of all projects, including the East Span Project (see Section 4.14.4 — Construction Period Air Quality for a listing of standard specifications).

4.15.7 Noise and Vibration

Context

The regulatory framework for noise assessments consists of FHWA's Procedures for Abatement of Highway Traffic Noise and Construction Noise. The project-specific noise analysis is cumulative in approach because it uses projected future traffic data added to ambient noise to assess combined future noise (with and without project noise levels). Impacts are in terms of anticipated noise levels at land uses in proximity to the proposed project.

There is no regulatory guidance for assessment of vibration impacts of transportation projects (see Section 4.14.5 — Construction Period Noise and Vibration for a discussion of vibration impact assessment methodology used for the East Span

Project). No long-term or construction-period cumulative vibration impacts would result from East Span Project alternatives.

For the East Span Project, the geographic context includes receptors on YBI, TI, and the Oakland Touchdown area at which noise levels could change as a result of the project. Land uses and receptors are discussed in Section 3.5.2 — Land Uses and Noise- and Vibration-sensitive Receptors. Past and present land use trends within the project limits indicate a mixture of transportation, industrial, and institutional uses that contribute to a noise environment in which noise-sensitive land uses (e.g., the BEQ in the USCG facility) have in the past and currently experience noise levels at or exceeding FHWA's noise abatement criteria (see Section 3.5.3 — Noise Abatement Criteria and Analysis Guidelines). Future land uses on YBI and TI are expected to generate noise levels similar to existing conditions. The East Span would continue to be a major noise source affecting noise-sensitive land uses in the vicinity of the bridge. Reasonably foreseeable land use patterns at the Oakland Touchdown indicate that transportation and industrial noise sources would continue to predominate. In addition, 5.9 hectares (14.7 acres) at the westernmost end of the former Oakland Army Base property have been designated for a future park.

Other projects that could contribute to cumulative noise impacts include construction projects on YBI related to development scenarios outlined in the 1996 Draft Reuse Plan.

Impacts Analysis

Permanent Impacts. The Retrofit Existing Structure Alternative would not change existing noise levels. The replacement alternatives would reduce noise levels at many locations because of the use of certain types of road surface and construction materials and the single-deck bridge design (see Section 4.5 — Noise and Vibration).

Construction-Period Noise Impacts.

Based on the CCSF's 1996 Draft Reuse Plan, redevelopment on YBI would occur after the East Span Project is completed. The Clipper Cove marina expansion could generate noise from pile driving and construction of new marina buildings. However, construction of the Clipper Cove expansion (which will commence on completion of environmental reviews and approvals) would not contribute to noise impacts to the land uses on YBI that would be impacted by the East Span Project alternatives because of the distance between the two construction sites. At distances greater than 480 meters (1,580 feet) sound attenuation would typically result in noise levels from construction activities that are not be distinguishable from existing noise levels. (See Section 4.14.5 — Construction-period Noise and Vibration for a discussion of construction noise attenuation over distance). Therefore, no cumulative impact is expected to result.

The City of Oakland's plans for the Oakland Touchdown area and Caltrans' reconstruction concepts for the SFOBB Toll Plaza have not been developed to a stage that would allow estimation of the type of construction activity or the timeline. These projects would require construction activities such as pile driving, excavation, and other noise generating activities. Should these projects be undertaken simultaneously with East Span Project construction at the Oakland Touchdown, combined noise levels

could result in an increase in noise levels at the Oakland Touchdown area. There are no noise-sensitive land uses at the Oakland Touchdown area. The planned Gateway Park is a reasonably foreseeable action, but would not be constructed until the East Span Project construction is completed. Therefore, no noise-sensitive land uses would experience construction-period cumulative impacts

4.15.8 Hazardous Wastes

Context

The regulatory context for determining the environmental impacts of disturbance or release of contamination or hazardous wastes are federal, state, and local codes, regulations and guidance directing hazardous waste remediation, and the transport, storage and disposal of hazardous wastes (see Section 3.6.1 — Hazardous Wastes, Legal and Regulatory Requirements).

The geographic context is the eastern portion of YBI and the Oakland Touchdown area; ground disturbance related to construction projects in these areas could result in exposure of workers or nearby residents to hazardous wastes. Past and current land uses are discussed in Section 3.6.4 — Hazardous Wastes, Historical Information Update and Site Reconnaissance and Section 3.6.5 — Hazardous Wastes, Potential Sources of Contamination.

Past trends that may have contributed to the deposition of hazardous wastes on YBI include operation of military facilities and the SFOBB. At the Oakland Touchdown area, operation of the Port of Oakland, former Oakland Army Base, EBMUD treatment and outfall facilities, and the bridge and Caltrans maintenance facilities have contributed to the presence of hazardous wastes.

Foreseeable trends are decreasing deposition of hazardous wastes due to regulations controlling the use and disposal of hazardous wastes and materials. Future actions that could contribute to exposure of workers or residents to hazardous wastes are construction projects on YBI that may be undertaken to implement the CCSF's 1996 Draft Reuse Plan and construction of the planned Gateway Park at the Oakland Touchdown area.

The quality of sediments in the Bay in terms of presence or absence of contaminants is addressed in Section 4.15.10 — Water Quality.

Impacts Analysis

Permanent Impacts. The Retrofit Existing Structure Alternative and Replacement Alternatives N-2, N-6 (Preferred), and S-4 would not result in deposition of hazardous wastes and would therefore not contribute to cumulative impacts (see Section 4.6.1 — Hazardous Wastes, Summary and Comparison of Alternatives). Remediation of hazardous wastes and/or sites as a result of construction of any of the alternatives combined with redevelopment on YBI and construction of the proposed Gateway Park at the Oakland Touchdown area would cumulatively result in decreased future risk of exposure to hazardous wastes within the project limits because the hazardous wastes would be removed from the area and placed at regulated disposal sites.

Construction-Period Impacts. Construction of the Retrofit Existing Structure Alternative and Replacement Alternatives N-2, N-6 (Preferred), and S-4 would have the potential to encounter contamination and increase the possibility of worker and public exposure to hazardous wastes. Other projects on YBI and at the Oakland Touchdown area could also encounter contamination and expose workers and the public to hazardous wastes. Although multiple projects increase the potential for contamination or exposure, the East Span Project alternatives and other projects on YBI and at the Oakland Touchdown area are currently employing or would use established exposure control procedures and safety plans to guide remediation activities. Therefore, cumulative impacts would be avoided.

4.15.9 Geology, Soils, and Seismicity

Context

The regulatory context for the geology, soils, and seismicity analysis is federal, state, and local laws that establish building and structure safety codes. Compliance with these laws is ensured through the permit review process. The analysis has two geographic contexts; geology and soils impacts are addressed at a local level and seismic safety impacts are addressed at the regional level.

Geology and soils impacts are localized in nature; cumulative impacts would be based on the combined potential of projects to create unstable ground conditions that could result in danger to local populations or loss of resources. Therefore, the geographic context for the geology and soils cumulative impacts assessment is YBI, where unstable geologic conditions exist. The East Span Project would not contribute to potential geologic or soil stability impacts at any other locations (e.g., the Oakland Touchdown area). Projects that may contribute to cumulative impacts are limited to YBI redevelopment as described in the 1996 Draft Reuse Plan.

Past trends of development combined with natural erosion on steep slopes have contributed to unstable slopes on YBI.

The context for the seismicity assessment is the lifeline system of roads and bridges in the Bay Area region that Caltrans has designated to support emergency response. (See Section 1.2.1 — Lifeline Connection for an explanation of the lifeline transportation system.) Caltrans has designated a system of roadways and bridges in the Bay Area region which have designed, constructed or will be constructed to meet lifeline criteria at various locations on I-80 between San Francisco and the Nevada border, I-280, I-680, I-780, Route 24, Route 92, and Route 101.[18] Projects included in the cumulative assessment are seismic retrofit projects in the Transbay Corridor, including the West Approach Seismic Retrofit, the East Span Seismic Retrofit, the West Viaduct Seismic Retrofit, the YBI Tunnel Retrofit, and the distribution structure seismic retrofit.

Trends for seismicity are increasing the seismic safety of existing roads and bridges through seismic retrofit.

[18] Memorandum to District Directors from Transportation Planning Program, "The Statewide List of Lifeline Routes" dated December 19, 1997.

Impacts Analysis

Long-term and construction-period impacts are combined in this section because construction activities on unstable slopes can result in both immediate geologic changes and unstable conditions that can contribute to longer-term geologic impacts.

Impacts to Geology and Soils. The Retrofit Existing Structure Alternative would not change local geologic conditions at YBI and would not contribute to cumulative impacts. The replacement alternatives would place bridge foundations on YBI in areas with steep slopes (i.e., greater than 30 percent). Excavation activities in these areas could destabilize and erode steep slopes. Caltrans would restore and stabilize slopes to minimize impacts from construction.

Unstable slopes above the USCG facilities are subject to slides during heavy rains. The USCG takes actions to stabilize slides. These actions would be expected to continue on slopes not impacted by the temporary detours for the East Span Project. The combination of the East Span Project and the USCG actions would contribute to a cumulative improvement in slope stability on the eastern portion of YBI.

The 1996 Draft Reuse Plan for redevelopment on YBI does not include development on steeply sloping areas; therefore, the East Span Project is the only project anticipated to involve steep (greater than 30 percent) areas. Thus, no cumulative impacts would result.

Seismicity Impacts. The East Span Project build alternatives would have a beneficial impact on seismic safety of the traveling public and no projects are known that would undermine the East Span Project improvements. Therefore, no cumulative impacts would occur.

4.15.10 Water Quality

Context

The regulatory context for the cumulative water quality analysis are federal, state, and regional regulations which address protection and enhancement of the beneficial uses of the water in San Francisco Bay and its tributaries. The geographic context is the Central Bay portion of the San Francisco Bay basin, which is described in the San Francisco Bay Regional Water Quality Control Board (RWQCB) Basin Plan.

The Basin Plan sets forth water quality objectives to protect and enhance the beneficial uses of the Bay and its tributaries. One of the mechanisms used by the RWQCB to maintain and/or attain the water quality objectives is to stipulate the objectives of the Basin Plan in National Pollutant Discharge Elimination System (NPDES) permits issued to municipalities and agencies for all projects in the San Francisco Bay basin. The East Span Project and other projects in the Central Bay would be subject to NPDES permitting.

Projects included in the analysis are those within the Central Bay. These projects include local construction activities such as private developments that increase runoff

into the Bay and dredging for navigation purposes at the Ports of Oakland, Richmond, and San Francisco. Planned improvements for the Port of San Francisco include reuse of Piers ½, 3, and 5 and development of the International Cruise Ship Terminal. The Port of San Francisco projects are in the early phases of planning and project descriptions are not developed to the extent that potential water quality impacts can be estimated.

Since the Gold Rush the quality of the Bay's water has historically been adversely affected by a variety of economic activities. Among these activities are hydraulic gold mining, agriculture, grazing, logging, major and minor shipping, ports, marinas, commercial and recreational fishing, waste water discharge, urban activities, and industrial development along the Bay shoreline. Past activities such as wastewater discharges, dumping of wastes, and industrial runoff have created numerous areas of contaminated sediment around the Bay. Common contaminants include metals, pesticides, and toxic organics. Despite these past activities, the San Francisco Bay basin supports diverse and productive environmental resources.

A Regional Monitoring and Assessment Strategy Program evaluates Bay water and sediment at approximately 20 locations throughout the Bay. In general, the results of this monitoring are:

- PCB concentrations exceeded guidelines at all locations;
- Pesticides such as DDT, dieldrin, and chlordane were above water quality objectives at several sampling stations;
- The trace metals copper, nickel, lead, mercury, and chromium were above guidelines at several locations, especially in the North Bay;
- No toxicity to aquatic organisms due to water quality was found; and
- Sediment toxicity was widespread, even though only nickel concentrations exceeded guidelines.

In the Central Bay, where the East Span Project is located, water quality data from regional monitoring and the Caltrans monitoring program indicate that most of the water quality objectives in the Basin Plan are being met. This indicates a trend of water quality improvement in the Central Bay, although water quality objectives for the entire Bay are not being met.

Impacts Analysis

Permanent Impacts. The Retrofit Existing Structure Alternative would not impact the existing runoff level of the SFOBB into the Bay.

As discussed in Section 4.8.1 — Surface Water Quality, the replacement alternatives have features that would improve the quality of storm water runoff. There is an overall improvement in the type of materials such as concrete used in the replacement alternatives compared with the existing East Span. A replacement structure would be a predominately concrete structure that would have limited exposed steel, which reduces the need for painting and paint removal. Painting would occur once every 10 to 15 years with a non-lead paint. The elimination of lead-paint removal and painting on a replacement structure should provide a long-term reduction in adverse water quality

associated with the existing structure. Other design features of the replacement bridge such as standard shoulders, standard lane widths, and increased sight distances would all contribute to improved water quality of bridge run-off by improving safety and traffic flow. Overall water quality of bridge run-off is expected to improve; therefore, the replacement alternatives would not contribute to cumulative adverse impacts on Bay water quality and in fact would have beneficial impacts.

From a cumulative perspective, the RWQCB will continue to permit projects in a manner intended to meet the objectives outlined in the Basin Plan, resulting in improved water quality in the San Francisco Bay.

Construction-Period Impacts. Construction activities for the build alternatives would result in an increase in turbidity containing pollutants due to dredging, pile driving, propeller wash from tugboats/barges, and mud boils. In combination with in-water construction activities for dredging for projects at the Ports of Oakland and Richmond (channel deepenings and improvements), cumulative impacts to water quality could occur as a result of increased turbidity. However, mitigation measures, detailed in Section 4.14.7 — Temporary Impacts During Construction Activities, Water Resources and Water Quality, would minimize turbidity and sediment mobilization to the greatest extent possible.

4.15.11 Natural Resources — Bay Fill

Context

The regulatory context for the Bay fill cumulative impacts analysis includes state laws regarding fill in San Francisco Bay (see Section 4.9.1 — Natural Resources, Placement of Fill in the San Francisco Bay, for a definition of fill and discussion of calculation of fill quantities). This cumulative impacts analysis uses the San Francisco Bay Conservation and Development Commission's (BCDC's) definition of fill because BCDC has the most comprehensive policies on placing fill in the Bay. BCDC administers the McAteer-Petris Act and the San Francisco Bay Plan, which governs the manner and purpose of filling San Francisco Bay and limits such fill to water-oriented uses such as improving public access or shoreline appearance. BCDC issues permits for solid, pile-supported, floating, cantilevered, and high-level suspended fill placed bayward of the mean high tide line or the +1.5-meter (+5.0-foot) contour mean sea level where marshlands are present. The cumulative impact assessment considers the impact of the East Span Project and other projects on the surface area of San Francisco Bay.
The geographic context for the Bay fill cumulative impacts analysis is Central San Francisco Bay. San Francisco Bay has been divided into subregions in the planning documents of several regulatory agencies and organizations including the San Francisco Bay Area Wetlands Ecosystem Goals Project (Goals Project) and BCDC's Bay Plan. The Central Bay subregion includes the main body of San Francisco Bay and extends along the western shore from Point San Pedro in Marin County to Coyote Point in San Mateo County and along the eastern shore from approximately the Emeryville Crescent to San Leandro Marina in Alameda County.

In the last 200 years filling and diking have reduced the Bay from its historic size of 1,761 square kilometers (680 square miles) to approximately 1,114 square kilometers

(430 square miles). BCDC was established in 1965 to limit indiscriminate filling of San Francisco Bay. Since that time the trend of filling the Bay has been reversed. In 1999, BCDC approved projects that will result in a net increase of 105 hectares (258 acres) of Bay surface area. This increase in the size of the Bay's surface area has been a consistent trend for the past several years.

BCDC's annual report provides data (new Bay surface area minus new Bay fill area) on Bay fill trends for the entire Bay. The data were analyzed to assess the East Span Project's cumulative impacts on Bay fill. Between 1970 and 1999, the net increase in Bay surface area was approximately 701 hectares (1,731 acres). Past projects included in these figures are the Port of San Francisco's enhancements at and near the Ferry Building; the commercial fishing harbor near Hyde Street Pier; Pier 39 Limited Partnership; Port of San Francisco's Forbes Island Project; and the Westbound Carquinez Bridge Replacement Project.

Fill types included in the cumulative impacts analysis for the East Span Project include placement of pile-supported fill for piles and pile caps; solid fill for the westbound roadway; high-level suspended fill for the bridge decks; and temporary pile-supported fill for access trestles and docks required to construct projects within the Bay. High-level suspended fill from bridges crossing the Bay is included in the analysis because such fill is regulated by BCDC. However, this type of fill generally does not cause permanent shading or result in other environmental impacts to the Bay because of its substantial height above the surface of the Bay.

Projects included in the cumulative impacts analysis are within Central San Francisco Bay and involve fill in the Bay. These projects are the San Mateo-Hayward Bridge Trestle Widening Project; Port of San Francisco Pier 1 Enhancements; the San Francisco International Airport Runway Reconfiguration Project; Port of Oakland's Harbor Navigation Improvement (-50-foot) Project; and the Port of Oakland Berth 55-58 Project. Other Port of San Francisco projects, such as the International Cruise Ship Terminal and redevelopment of Piers ½, 3, and 5 are in the planning stages; Bay fill associated with these projects cannot yet be estimated.

Impacts Analysis

The methodology for the fill impacts analysis considers the permanent change in the surface area of the Bay. Temporary fill associated with projects is also regulated by BCDC but is not included in the cumulative impacts analysis because temporary fill does not contribute to long-term trends for change in the size of San Francisco Bay. (See Section 4.14.8 — Temporary Impacts During Construction Activities, Natural Resources, for calculation of temporary fill quantities.) All build alternatives would add fill in San Francisco Bay as defined by BCDC.

The Retrofit Existing Structure Alternative would increase the amount of solid and pile-supported fill but would not increase the amount of high-level suspended and cantilevered fill since the fill would be placed within the footprint of the existing bridge. Solid and pile-supported fill required to retrofit the existing East Span would be added under the deck area of the existing East Span (see Section 4.9.1 — Placement of Fill in San Francisco Bay, for a discussion of BCDC regulated fill).

Replacement alternatives would increase the amount of pile-supported and solid fill by adding new piles and pile caps and constructing the westbound roadway; they w1ould also increase the amount of high-level suspended and cantilevered fill by replacing the existing double-deck East Span with two parallel bridge decks. The resulting decrease in Bay surface area would be approximately 18 hectares (45 acres) for Replacement Alternative N-2, approximately 19 hectares (47 acres) for Replacement Alternative N-6, and approximately 17 hectares (43 acres) for Replacement Alternative S-4 (see Section 4.9.1 — Placement of Fill in San Francisco Bay for a discussion of the BCDC regulated fill impacts of the replacement alternatives).

Table 4.15-1 summarizes the available information about the area of Bay fill for other recent and planned projects included in the cumulative impacts analysis.

Combined with the East Span Project replacement alternatives, these projects would result in a net decrease in the surface area of the Bay. This is largely from the high-level suspended fill associated with the East Span Project which generally does not adversely impact the Bay. Nevertheless this could be considered inconsistent with the McAteer-Petris Act and the Bay Plan policies to minimize fill in the Bay and regional efforts to increase the size of San Francisco Bay through fill removal and habitat restoration. A cumulative impact would result from the combined actions.

The East Span Project and each of the recent and planned projects listed in Table 4.15-1 would have mitigation measures. that if successfully implemented and if high-level suspended fill is excluded from the impacts analysis, would result in a net increase in Bay surface area.

Table 4.15-1 Bay Surface Area Fill Summary

Project	Change in San Francisco Bay Surface Area in Hectares (Acres)
East Span Project Replacement Alternatives	17 to 19 hectares (43 to 47 acres) decrease in surface area of the Bay
San Mateo-Hayward Bridge Trestle Widening Project	0.02 hectare (0.04 acre) decrease in surface area of the Bay
Port of San Francisco Pier 1 Enhancements	0.09 hectare (0.22 acre) decrease in surface area of the Bay
San Francisco International Airport Runway Reconfiguration Project	607 hectares (1,500 acres) decrease in surface area of the Bay
Port of Oakland, Oakland Harbor Navigation Improvement (-50 foot) Project	10.9 hectares (27 acres) decrease in surface area of the Bay
Port of Oakland Berth 55-58 Project	4.4 hectares (11 acres) increase in surface area of the Bay

Source: Caltrans, January 2001.

4.15.12 Natural Resources — Special Aquatic Sites

Context

The regulatory context for the cumulative impacts analysis of special aquatic sites is Section 404 of the Clean Water Act. The ACOE regulates fill in special aquatic sites (wetlands, eelgrass, and sand flats) in Waters of the United States. The ACOE has a no-net-loss policy that requires each project to avoid and minimize impacts to special aquatic sites and to mitigate for unavoidable impacts to special aquatic sites. The McAteer-Petris Act and the San Francisco Bay Plan administered by BCDC also regulate fill in San Francisco Bay including special aquatic sites. However, the Section 404 regulations administered by the ACOE are used in this cumulative impacts analysis because their regulations are more comprehensive than BCDC policies in terms of special aquatic sites. Mitigation for unavoidable impacts to special aquatic sites and success criteria are developed in coordination with the ACOE, RWQCB, USFWS, EPA, BCDC, and CDFG.

The geographic context for the special aquatic sites cumulative impacts analysis is Central San Francisco Bay. San Francisco Bay has been divided into subregions in the planning documents of several regulatory agencies and organizations including the San Francisco Bay Area Wetlands Ecosystem Goals Project (Goals Project) and BCDC's Bay Plan as described above.

The trend in the last 200 years has been the loss of special aquatic sites due to diking and filling for agriculture and development. Approximately 93 percent of Central San Francisco Bay's original 5,447 hectares (13,461 acres) of tidal marshes have been lost (Baylands Ecosystem Habitat Goals, 2000). The approximately 383 hectares (947 acres) of remaining wetlands are threatened by development, erosion, pollution, and sea level rise (USGS and Chavez, et al. 1995). In addition, watershed nutrient and sediment loading from the Delta as well as Bay dredging and filling have affected eelgrass although recent data suggest a possible expansion of eelgrass habitat in the Central Bay since 1987 (Merkel and Associates, unpublished data). Factors affecting wetlands and eelgrass have also contributed to the loss of tidal flats. Approximately 70 percent of San Francisco Bay's original 5,476 hectares (13,532 acres) of tidal flats have been lost (Baylands Ecosystem Habitat Goals, 2000). Tidal flats, including the large grain sand flats found within the East Span Project limits, have been created in the Bay by millennia of natural accretion of sediments.

The methodology for this assessment uses the Goals Project, information concerning upland wetland reuse projects identified during development of the Dredged Material Management Plan (See Appendix M), and consultation with ACOE, RWQCB, BCDC, EPA, USFWS, and CDFG. This qualitative approach was employed absent a database of San Francisco Bay wetland impacts or Section 404 applications.

Impacts Analysis

Because a database of past, current, and reasonably foreseeable future projects in the Central Bay that would impact special aquatic sites is not available, it is not possible to specifically measure the cumulative impacts to existing special aquatic sites.

Accordingly, impacts have been estimated in the context of regional planning for the enhancement and restoration of special aquatic sites.

The Retrofit Existing Structure Alternative would not impact any special aquatic sites.

The replacement alternatives would have permanent impacts to sand flats, eelgrass beds, and non-tidal wetlands (see Section 4.9.2 — Special Aquatic Sites). The total areas impacted are summarized in Table 4.15-2.

Table 4.15-2 Summary of Replacement Alternative Permanent Impacts to Special Aquatic Sites

Special Aquatic Sites	Replacement Alternative N-2	Replacement Alternative N-6	Replacement Alternative S-4
Non-tidal Wetland	0.00	0.00	0.05 hectare (0.12 acre)
Sand Flats	1.36 hectares (3.36 acres)	1.36 hectares (3.36 acres)	0.01 hectare (0.03 acre)
Eelgrass	0.22 hectare (0.55 acre)	0.22 hectare (0.55 acre)	0.15 hectare (0.37 acre)
TOTAL	1.58 hectares (3.91 acres)	1.58 hectares (3.91 acres)	0.21 hectare (0.52 acre)

Although a comprehensive database of potential impacts to wetlands is not available, two projects in planning stages that would affect Central Bay wetlands or other special aquatic sites are the San Francisco International Airport Runway Reconfiguration Project and the Port of Oakland's port and airport expansion. The San Francisco International Airport Runway Reconfiguration Project could fill approximately 607 hectares (1,500 acres) of Bay surface area to add new runways. It is not known what portions of the total area are tidal flats or shallow Bay habitats that may be special aquatic sites as defined by Section 404 of the Clean Water Act. The Port of Oakland's airport expansion would fill approximately 2.8 hectares (7 acres) of wetlands. The Port of Oakland's dredging project would impact 0.08 hectare (0.2 acre) of eelgrass but would add approximately 6 hectares (15 acres) of shallow water eelgrass habitat as part of the Middle Harbor Enhancement Area.

Review of ACOE permit applications for work in Central San Francisco Bay for the years 1999 and 2000 documented two projects that impacted Central San Francisco Bay wetlands. The Eden Landing Ecological Reserve tidal marsh restoration project will restore 230 hectares (570 acres) of tidal marsh. Small areas of non-tidal wetlands within the Eden Landing parcel will be replaced with tidal marsh wetlands. The second project, a roadway expansion project in San Mateo County, will have permanent impacts to 0.27 hectare (0.68 acre) of wetlands. Impacts caused by the roadway expansion project will be mitigated through the creation of 0.53 hectare (1.3 acres) of wetlands. Combined, these two projects will result in the net addition of 230 hectares (570 acres) of restored tidal marsh in Central San Francisco Bay.

Caltrans has coordinated with federal and state resource agencies to develop mitigation measures to offset project impacts to special aquatic sites (the conceptual mitigation plan is described in Section 4.9.6 — Natural Resources, Mitigation). The replacement alternatives would impact up to 1.58 hectares (3.91 acres) of special aquatic sites (see Table 4.15-2). Proposed mitigation for impacts to special aquatic sites includes the on-site restoration of portions of the sand flats and eelgrass beds and off-site creation of a tidal marsh ecosystem. The out-of-kind mitigation concepts are designed to replace the functions and values of the sand flats and eelgrass beds, to the extent possible, through creation of a tidal marsh ecosystem consistent with the objectives of the Baylands Habitat Ecosystem Goals Project. The East Span Project would contribute to a cumulative impact on existing special aquatic sites, but would replace the special aquatic sites at a 3:1 ratio.

The East Span Project in combination with known projects that may impact special aquatic sites would contribute to a cumulative loss of special aquatic sites. However, each project that impacts special aquatic sites must comply with federal Clean Water Act Section 404 requirements implemented by the ACOE, which has a policy of no-net-loss of special aquatic sites. The conceptual mitigation plan for the East Span Project would result in a net increase in the total acres of special aquatic sites in San Francisco Bay. Combined with mitigation to ensure no-net-loss for other recent projects impacting wetlands, in addition to recent tidal marsh restoration projects such as the Eden Landing Ecological Reserve, a net increase in special aquatic sites in Central San Francisco Bay would occur. This net increase would contribute to a reversal of the historic trend for loss of special aquatic sites in San Francisco Bay.

4.15.13 Natural Resources — Special Status Species

Context

The regulatory context for the special status species cumulative impacts analysis is the federal and state laws which protect species. The federal and California Endangered Species Acts provide protection for species listed as rare, threatened, or endangered. Avian species are protected by the federal Migratory Bird Treaty Act, marine mammals are protected by the Marine Mammal Protection Act, and fish species protected under the Magnuson-Stevens Act. Species that may be impacted by the East Span Project are migratory birds and shorebirds, American peregrine falcon, double-crested cormorant, Pacific herring, Chinook salmon, steelhead, green sturgeon, longfin smelt, harbor seal, California sea lion, and gray whale.

The overall geographic context for the special status species cumulative analysis is San Francisco Bay (including San Pablo Bay) and marine and shoreline habitats. Geographic contexts vary by type of species. The geographic context for avian species consists of roosting sites in the San Francisco Bay Area. The geographic context for fish is Central San Francisco Bay and the geographic context for marine mammals (harbor seals) are the haul-out sites in Central San Francisco Bay. These geographic limits are further described in the sections below.

Past trends affecting aquatic habitat for fish and marine mammals are water quality degradation discussed in Section 4.15.10 — Water Quality and reduction in the area of

San Francisco Bay described in Section 4.15.11 — Bay Fill. Trends in water quality and land development have placed pressure on species that have historically used the Bay for foraging and nesting. The result has been increased pressure on remaining habitat to support the special status species that may be present in the East Span Project area.

Past trends in the Bay Area for the protected avian species have been reductions in their numbers due to loss of habitat from development and impacts of chemicals such as DDT, which has caused eggshell thinning and thereby reduced birth rates. In recent years, some avian species have increased in numbers due to the ban on DDT and successful captive breeding. Peregrine falcons have adapted to non-traditional habitats such as tall buildings and bridges; double-crested cormorants have also adapted to non-traditional habitats such as bridges and power lines in water. As a result, both species have shown significant increases in population in recent years. In fact, the falcon was recently removed from the federal endangered species list because of the increase in its numbers.

Other projects considered in the analysis are the Richmond-San Rafael Bridge Retrofit Project, construction activities and dredging for projects at the Port of Oakland, and seismic retrofits of the Carquinez, Benicia-Martinez, Richmond-San Rafael, and Golden Gate bridges.

Impacts Analysis

Permanent Impacts to Avian Species. The Retrofit Existing Structure Alternative would retain existing habitat for the American peregrine falcon and double-crested cormorants. If the peregrine falcons are disturbed during construction such that nesting is adversely impacted, the biologists monitoring them can relocate eggs or chicks. Retrofit of the existing structure would not change roosting habitat for migratory birds and foraging and resting habitats for shorebirds would not be affected.

Replacement Alternatives N-2, N-6 (Preferred), and S-4 would remove habitat for the peregrine falcon. Measures consistent with the Migratory Bird Treaty Act would minimize direct impacts (see Section 4.9.6 — Natural Resources, Mitigation). Peregrine falcons would likely nest on a replacement bridge once construction activities associated with the project are complete. The continuing trend of recovery of the species combined with the potential for the replacement alternatives to provide new nesting habitat indicates that a loss in nesting habitat would not occur as a result of the East Span Project combined with other actions. No other projects have been identified that would remove existing nesting sites. Therefore, cumulative impacts are not expected to occur.

Development in the Bay has resulted in reductions of suitable habitat for the double-crested cormorant, which have caused them to adapt to non-traditional habitats such as the SFOBB and the Richmond-San Rafael Bridge. The colony on the SFOBB is the second largest one in Northern California. The colony at the Farallon Islands marine sanctuary is the largest in Northern California. The replacement alternatives would remove the habitat for the double-crested cormorant colony. Seismic retrofit of the Richmond-San Rafael Bridge, the only other planned project known to have potential to

impact cormorants, is not expected to affect them. The Richmond-San Rafael Bridge seismic retrofit will not remove active nests. Provision of nesting habitat on replacement alternatives or its retention on the Retrofit Existing Structure Alternative on the East Span Project and retention of nesting habitat on the Richmond-San Rafael bridge would avoid cumulative impacts to double-crested cormorants.

Development in the Bay has resulted in reductions of suitable nesting habitat for migratory birds. The Migratory Bird Treaty Act protects nesting activities of migratory birds and does not regulate development that impact habitat for avian species. The replacement alternatives would not restrict nesting activities of migratory birds and therefore would not, in combination with other projects, contribute to long-term cumulative impacts to migratory birds.

Shorebirds use sand flats within the project limits for foraging and resting. As described in Section 4.15.12 — Natural Resources, Special Aquatic Sites, the replacement alternatives would contribute to a cumulative impact to special aquatic sites and therefore a cumulative impact to shorebirds. Special aquatic sites mitigation for the replacement alternatives would contribute to an overall increase in sand flats in Central San Francisco Bay (see Section 4.15.12).

Construction-Period Impacts to Avian Species. Nesting and breeding activities of the peregrine falcon, double-crested cormorants, and other migratory birds on the existing structure could be disrupted by noise and other construction activities related to the build alternatives. Mitigation measures would include monitoring the peregrine falcon during nesting and removing eggs or chicks if monitors determine that the disturbance is adversely affecting nesting activities and prevention of double-crested cormorants and other migratory birds from nesting on the structure (see Section 4.14.8 — Temporary Impacts During Construction Activities, Natural Resources). Under the conditions of the Migratory Bird Treaty Act, a nest cannot be disturbed if nesting activities have begun. Specifications for the Richard-San Rafael Bridge seismic retrofit call for prevention of nesting during retrofit activities but if nesting has begun the nests cannot be disturbed. Because the East Span Project replacement alternatives would dismantle the existing East Span after construction of the Richmond-San Rafael bridge seismic retrofit work is complete, there is no potential for cumulative construction period impacts.

Construction of the replacement alternatives will disturb sand flats at the Oakland Touchdown area used by shorebirds for resting and foraging. In combination with construction activities for the project considered in Section 4.15.12, a reduction in shorebird resting and foraging habitat could occur. This would cause a cumulative impact.

Mitigation for impacts due to temporary disturbance to special aquatic sites is required for all projects will also provide mitigation for temporary disturbance of shorebird resting and foraging habitat (see Section 4.14.8 — Temporary Impacts During Construction Activities, Natural Resources for a discussion of East Span Project impacts to sand flats).

Permanent Impacts to Fish Species. No permanent impacts to fish would result from the build alternatives.

Construction-Period Impacts to Fish Species. Construction activities for the build alternatives could result in an increase in turbidity that could impact migratory fish species including Pacific herring, Chinook salmon, steelhead, green sturgeon, and longfin smelt. In combination with dredging for projects at the Port of Oakland that could be underway during construction of the East Span Project, the potential for cumulative impacts to occur as a result of increased turbidity to these species was assessed. Investigation of sediment transport from East Span Project dredging activities indicates that sedimentation and turbidity impacts are localized and temporary, with suspended material settling rapidly. Analysis indicated a low potential for the East Span Project build alternatives to contribute to sediment increases in the vicinity of the Port of Oakland (see response to Comment 4 of the Port of Oakland's letter responding to the DMMP dated July 21, 1999 in Volume II, Section 2 — DMMP Comments and Responses). Therefore, large areas of increased turbidity would not result from the projects considered in the assessment and cumulative impacts would not occur.

Pile driving for East Span Project build alternatives may have impacts on fish within the immediate vicinity. Impacts on fish from driving large piles in the Bay are not well documented. During the Pile Installation Demonstration Project (PIDP) completed in December of 2000, injury and mortality to small fish were observed within the immediate vicinity of pile driving operations. While the results of the PIDP have not been finalized, preliminary results indicate that use of noise attenuation devices reduces impacts to small fish near pile driving. Caltrans will continue coordinating with NMFS regarding interpretation of the PIDP results. In compliance with NMFS' Biological Opinion, Caltrans would require that sound attenuation measures be included in pile driving specifications for any pile driving during the peak juvenile salmonid outmigration period of January 1 through May 31. Provision of sound attenuation during the peak outmigration period would avoid construction-period cumulative impacts to special status fish and would also benefit other fish species during that period.

Because there is limited information available concerning potential for fish kill due to pile driving in the Bay, cumulative impacts to fish cannot be determined.

Permanent Impacts to Marine Mammals. No long-term impacts to marine mammals would result from the build alternatives.

Construction-Period Impacts to Marine Mammals. Underwater sound pressure levels generated by pile driving for all build alternatives could result in temporary impacts to harbor seals. There are 12 harbor seal haul-out sites and rookeries in the Bay; of those, only eight are used by more than a few animals at a time. Three sites in the Bay regularly host more than 40 harbor seals at any one time. The three closest sites to the project area are YBI, Angel Island, and Castro Rocks near the Richmond-San Rafael Bridge. Surveys at these sites indicate that pupping activities occur at Castro Rocks but do not occur at the YBI haul-out site.

Retrofit of the Richmond-San Rafael Bridge, scheduled for completion by March 2004, could also result in temporary impacts to harbor seals. A mitigation and monitoring plan has been developed to protect them. The plan includes restriction of certain retrofit activities near Castro Rocks to avoid impacts to harbor seals during pupping season, regular monitoring of haul-out sites in the Bay, and collection of data by direct observation, analysis of videotape data, and surface and underwater audio analysis. No other projects in San Francisco Bay, including the seismic retrofit of the Carquinez or Benicia-Martinez Bridges, are anticipated to impact harbor seals because no harbor seal haul-out sites are located in the vicinity of these projects.

Data indicate that harbor seals return to haul-out sites when construction activities cease. The East Span and Richmond-San Rafael Projects do not physically impact the haul-out sites and activities related to these projects that may impact harbor seals would be intermittent (e.g., pile driving, vessel traffic passing haul-out sites, or increased human activity). Because the haul-out sites would not be directly used for construction activities and the activities would be intermittent, cumulative impacts during construction of the East Span Project in combination with the seismic retrofit of the Richmond-San Rafael Bridge are expected to be minimal.

Potential East Span Project impacts to marine mammals were evaluated during the Pile Installation Demonstration Project. The PIDP was completed in December 2000 and data from the project are being analyzed. Initial results indicate no impacts to marine mammals at the YBI haul-out site and minimal impacts to marine mammals at the PIDP site. Once this analysis is complete, a mitigation and monitoring plan would be prepared in coordination with the NMFS to address potential construction-related impacts to harbor seals. Actions to avoid harassment of marine mammals would be implemented during construction.

4.15.14 Other Natural Communities

Context

The regulatory context for assessment of cumulative impacts to terrestrial natural communities is the California Department of Fish and Game's listing of Natural Communities of Special Concern.

Coast live oak woodlands exist along the coastline from Sonoma County to Baja California. Development has resulted in losses of oak woodlands. Apparent problems with regeneration of the species and infectious disease have raised concern for the health of oak woodlands. Oak woodlands are also subject to urbanization, changes in logging practices resulting in increased oak removal to accelerate conifer growth, the expanding wine industry, and livestock grazing.

Past trends since settlement by Europeans have been conversion of oak woodlands, including coast live oak woodlands, to range land. This trend is best documented in inland oak woodlands; from 1945 to 1973, over a million acres of land were cleared to provide rangeland. A general change in the perception of the value of oak woodlands emerged in the 1970s and 1980s. Aesthetic considerations and increased awareness

of the habitat value of the woodlands led to consideration of their protection and enhancement. Subsequent actions have included local and county tree preservation ordinances to address continuing loss of woodlands due to commercial and residential development, logging, and viticulture.

The geographic context for the other natural communities analysis is YBI. Woodlands on YBI are the only coast live oak woodlands within the project limits. Other projects that may contribute to cumulative impacts to coast live oak woodlands in the project limits are the 1996 Draft Reuse Plan and the City of San Francisco Fire Department's fuel load reduction project. The Oakland Touchdown area is not included in the geographic context because it is man-made.

Impacts Analysis

The Retrofit Existing Structure Alternative would not impact coast live oak woodlands. The replacement alternatives would impact coast live oak woodlands by removal of trees due to the realignment of Macalla Road. The trees on YBI would be replaced in-kind and woodland areas would be delineated as environmentally sensitive areas (ESAs) where possible. The master planting plan for YBI would include mitigation and monitoring for the coast live oak woodland impacted by the replacement alternatives.

Other projects on YBI are the 1996 Draft Reuse Plan and the San Francisco Fire Department fuel management program. No plans or schedules are in place to determine if woodlands would be impacted by these activities. Because there is limited information available concerning future uses that may affect coast live oak woodlands, cumulative impacts to the trees cannot be determined. However, mapping of coast live oak woodlands is available to ensure that redevelopment and forest management plans take into account the presence of the woodland, thereby minimizing the potential for cumulative impacts.

4.15.15 Historic Resources: Historic Bridges

Context

The regulatory context for cumulative impacts to cultural resources is the National Historic Preservation Act (NHPA) (see Section 3.10.1 — Historic and Cultural Resources, Regulatory Context). Cultural resources include historic bridges, historic buildings, and archaeological sites. The NHPA establishes the National Register of Historic Places (National Register), which is the nation's list of historic properties significant in American history, architecture, engineering, and archaeology. Section 106 review requires that federal agencies consider project impacts on historic properties listed on or eligible for listing on the National Register. Properties are determined eligible for listing or listed on the National Register at the national, state, and/or local levels of significance.

The geographic context includes major crossings of San Francisco Bay. Existing major crossings of San Francisco Bay are the large engineering structures that are components of the Bay Area transportation network. These major Bay crossings are the Antioch Bridge; the Southern Pacific (Union Pacific) railroad bridge at the eastern end of the Carquinez Strait, located adjacent to the Benicia-Martinez Bridge; the

Benicia-Martinez Bridge; the eastbound and westbound Carquinez Bridges between Crockett and Vallejo; the Golden Gate Bridge; the Richmond-San Rafael Bridge; the San Francisco-Oakland Bay Bridge; the San Mateo-Hayward Bridge; and the Dumbarton Bridge. Of these major crossings, four have been determined eligible or are listed on the National Register. They are the Southern Pacific railroad bridge (Carquinez), the westbound Carquinez Bridge, the Golden Gate Bridge including the Marina and Presidio viaducts, and the San Francisco-Oakland Bay Bridge. These Bay crossings are listed, in the process of being listed, or determined eligible for the National Register at the national level of significance (except for the Carquinez Bridge which was determined eligible at the state level) based on engineering and transportation attributes. Retrofitting and replacement projects are underway or have been completed for these historic structures, except for the Southern Pacific railroad bridge. The retrofits may result in changes to their historic characteristics. Future status of these historic properties is not a factor in determining listing or eligibility for the National Register.

Among these historic San Francisco Bay crossings, the vehicular bridges are being retrofitted or replaced to meet current seismic safety standards. The trends for historic vehicular bridges are either changes to their historic characteristics due to retrofitting or their loss due to their replacement; both retrofitting and replacements provide seismic safety. See Table 4.14-3 below for a list of projects on historic vehicular bridges and see Section 4.15.4 — Transportation for a discussion of other SFOBB projects). Neither major seismic retrofit nor replacement of the Southern Pacific railroad bridge has been proposed. Proposed actions are summarized in Table 4.15-3.

Table 4.15-3 Historic Vehicular Bridges Crossing San Francisco Bay

Structure	Seismic Strategy
Westbound Carquinez Bridge	Removal of historic bridge following construction of replacement bridge
Golden Gate Bridge	Retrofit of main span would have minor impacts to its historic characteristics. Retrofit of the Presidio and Marina viaducts have changed their historic characteristics.
SFOBB West Approach (5th Street to the San Francisco Anchorage at Rincon Hill)	Removal of the historic bridge and construction of a replacement bridge
SFOBB West Span	Retrofit of existing bridge would change its historic characteristics.
SFOBB East Span	Removal of historic bridge following construction of replacement bridge

Source: Caltrans, February 2001.

Impacts Analysis

A cumulative impact to historic San Francisco Bay crossings would result from their replacement or retrofit. Memoranda of Agreement (MOA) pursuant to NHPA for the SFOBB, Carquinez Bridge, and viaducts and main span of the Golden Gate Bridge stipulate measures to document the historic features of the bridges. This

documentation would be implemented partially through a museum exhibit, which would describe the historic context in which they were constructed and operated, and their influences on patterns of history and transportation in the San Francisco Bay Area. Because there are no plans to replace or retrofit the Southern Pacific railroad bridge, it would not contribute to cumulative impacts.

4.15.16 Historic Resources: Historic Buildings

Context

The regulatory context for cumulative impacts to historic buildings is the National Historic Preservation Act (see Section 3.10.1 — Historic and Cultural Resources, Regulatory Context).

The geographic context for historic buildings is comprised of the historic buildings on military bases surrounding San Francisco Bay that have been or are being closed under the Base Realignment and Closure (BRAC) process. The geographic context best represents the types of historic buildings that could be affected by the East Span Project. Naval Station Treasure Island (NSTI) is within the East Span Project limits. Historic buildings at the former NSTI on YBI within the East Span Project limits are the structures in the Senior Officers' Quarters Historic District, Building 10 and the associated garage, Building 267, and Building 262. Historic buildings within the former Oakland Army Base are located outside of the East Span Project limits. The Key Pier Substation, a historic transportation building located within the East Span Project limits, would be affected by the replacement alternatives. (See Section 3.10.3 — Historic and Cultural Resources, Historic Architectural Resources for a description of buildings within the East Span Project limits.)

NEPA environmental reviews have been conducted for BRAC actions at Bay Area military bases. There is a general trend of preservation of historic buildings at the closed bases. Available information on BRAC actions affecting historic buildings is summarized in Table 4.15-4.

Although some historic buildings are being removed as a result of BRAC closures, the general trend is toward preservation of historic buildings at former military bases in the San Francisco Bay Area. The East Span Project alternatives would be consistent with this general trend because the project would not remove historic buildings at former military bases in the San Francisco Bay Area.

The geographic context for historic transportation buildings is the historic buildings in the San Francisco Bay Area. This includes historic structures such as the San Francisco Embarcadero (Ferry Building), railroad depots along the San Francisco peninsula and in the East Bay, and the remaining structures associated with the Key System railroad. The trend for historic transportation buildings is their preservation. Historic railroad depots on the San Francisco peninsula and along the Northwestern Pacific Railroad in Marin and Sonoma Counties have been rehabilitated for transportation use or are being preserved.

Table 4.15-4 Trends in BRAC Closure Impacts to Historic Buildings

Military Installation	Impacts to Historic Buildings
Alameda Naval Air Station	Information not available
Hamilton Army Airfield	Eight buildings within the historic district are likely to be removed.
Hunters Point Naval Ship Yard	No historic buildings expected to be removed. MOA prepared to ensure preservation of buildings in the Commercial Dry Dock Historic District
Mare Island Naval Ship Yard	No historic buildings expected to be removed. MOA prepared to promote preservation of historic buildings.
Naval Air Station Moffett Field	De-established as a military facility and currently managed by NASA. No impacts to historic buildings.
Naval Station Treasure Island	National Register listed and eligible buildings are located on north TI and YBI. An MOA is being developed concerning future treatment of historic buildings. It is anticipated that no historic buildings would be removed.
Former Oakland Army Base	The Northwest and Northeast Historic Districts have been determined eligible for the National Register. Buildings within the historic districts would be removed.
Oakland Fleet Industrial Supply Center	Historic buildings would be removed from the Naval Supply Center, Oakland Historic District, and North Training Wall. MOA developed to record representative sample of structures to be removed.
Point Molate Naval Supply Center	National Register eligible historic resources existing within the base. They are being incorporated into the reuse plan and would be preserved.
Presidio of San Francisco	Restoration and adaptive reuse program for historic buildings is being implemented.

Impacts Analysis

Permanent Impacts. The cumulative impacts analysis for historic buildings considers the impacts of East Span Project build alternatives combined with other actions that may result in removal of historic buildings at closed military bases surrounding the San Francisco Bay or historic transportation buildings in the Bay Area. No historic military or transportation buildings would be removed by the project.

The East Span Project build alternatives would not contribute to a cumulative impact to historic military and transportation buildings because none would be modified or removed as a result of any of the build alternatives.

Construction-Period Impacts. Construction-period cumulative impacts to historic buildings at the BRAC bases considered in the impacts analysis (Naval Station Treasure Island and Oakland Army Base) could occur if construction activities at these locations occur simultaneously. Based on information in the 1996 Draft Reuse Plan, redevelopment work that would affect historic buildings on YBI would not be underway during East Span Project construction (See Section 4.1.5 — Community Impacts, Development Trends).

A construction schedule for the Oakland Army Base reuse plan is not available to use as the basis for evaluating construction-period cumulative impacts. Because the construction zones for the projects are not contiguous, there is no possibility of combined construction-period impacts.

4.15.17 Cultural Resources: Archaeological Resources

Context

The regulatory context for archaeological resources is the NHPA (see Section 3.10.1 — Historic and Cultural Resources, Regulatory Context). Besides the NHPA, the federal Native American Grave Protection and Repatriation Act and California Public Resources Code Sections 5097.98 and 5097.99 concern Native American remains.

The geographic context for the analysis is the perimeter of San Francisco Bay. The perimeter of the Bay was identified as the appropriate geographic context since it is where very large shellmounds, an important type of archaeological site, are located. This site type is not typically found elsewhere in California. In 1909, Nels Nelson of the University of California recorded 425 shellmounds around the margins of the Bay. Of these 425 shellmounds, approximately five are still visible and considered to be fairly intact. In terms of past trends approximately 400 of the shellmounds originally recorded by Nelson have been disturbed, most by leveling for development. At several of these sites, portions of largely intact archaeological deposits are known to remain below contemporary ground levels. It is possible that intact deposits remain below ground in many other locations, but quantifying the number of partially intact shellmounds that remain along the perimeter of the Bay is difficult: many have been covered by development. Identifying remaining deposits usually occurs during construction activities unless pre-construction archaeological investigations take place.

One shellmound, CA-SFr-04/H, has been recorded within the Area of Potential Effect for the East Span Project. The prehistoric component of the site is a contributing element to the site's potential National Register eligibility (see Section 3.10.2 — Historic and Cultural Resources, Archaeological Resources). The portion of CA-SFr-04/H visible at the time of Nelson's 1909 survey has been removed, but the field program conducted in connection with the East Span Project established that it still has intact subsurface deposits.

Impacts Analysis

As discussed in Section 4.10.2 — Cultural Resources, Impacts to Archaeological Resources, the Retrofit Existing Structure Alternative and Replacement Alternatives N-6 (Preferred) and S-4, including the temporary detours for the replacement alternatives,

could affect the prehistoric midden component of site CA-SFr-04/H. Replacement Alternative N-2 would avoid the site.

The removal of a portion of CA-SFr-04/H as a result of the East Span Project has an incremental impact on the preservation of shellmounds on the fringes of the Bay. It is unknown how many other shellmounds with subsurface, intact deposits still exist around the Bay or how many of these could be affected by construction in the reasonably foreseeable future. However, certain recent and reasonably foreseeable projects which could or have already affected shellmounds include the development of an office complex in Emeryville, potential construction of a parking lot in Berkeley, and a planned residential development in South San Francisco. These projects, combined with the East Span Project, would have a cumulative impact.

FHWA, USCG, SHPO, and ACHP have entered into an MOA with Caltrans as a concurring party, committing Caltrans to prepare a treatment plan for pre-construction archaeological data recovery in order to mitigate impacts to CA-SFr-04/H. The development of the treatment plan would involve all parties to the MOA as well as interested Native Americans.

Other projects along the Bay's shores could potentially affect archaeological resources. Such projects are subject to state and/or federal regulatory review under NEPA, NHPA, and/or CEQA. These reviews result in mitigation measures that would minimize any cumulative impacts to archaeological resources and ensure that data from such resources is documented and preserved.

4.15.18 Energy

Context

The regulatory context for the energy analysis is the NEPA mandate to include discussion of energy requirements and conservation measures in NEPA environmental documents (40 CFR 1502.16 (e)). A long-term energy impact assessment is not necessary for the project and thus a cumulative impacts determination is not required. This is because the regulatory context for the energy analysis requires a comparison among project alternatives of the barrels of oil consumed from long-term use of the facility and the East Span Project alternatives do not add traffic capacity compared to the No-Build Alternative. Therefore, long-term energy use is equal among all the project alternatives. There is the potential for the replacement alternatives, which include inside and outside shoulders, to improve traffic operations by reducing the traffic congestion impacts of accidents and breakdowns. The energy consumption benefits of the improved traffic operations of the replacement alternatives is minimal in comparison to the long-term energy consumption of vehicles using the bridge. It is not possible to measure this slight potential energy reduction due to improved traffic operations of adding shoulders because of the lack of predictability of accidents and breakdowns.

The energy analysis for the East Span Project compares the necessary energy to construct the build alternatives (see Section 4.13 — Energy) consistent with NEPA guidance. The geographic context for the construction-period energy analysis is the

United States. The other actions that could contribute to cumulative expenditure of energy during the East Span Project construction period are energy-consuming activities in the United States that would occur during East Span Project construction.

Trends for energy use are improvements to energy efficiency of construction equipment to reduce construction energy demands.

Impacts Analysis

Construction-Period Energy Consumption Impacts. East Span Project build alternatives would consume 3.5 to 6.5 million barrels of oil over the multi-year construction period (see Section 4.13.2 — Energy, Impacts for energy consumption of the build alternatives). This amount is negligible compared to available statistics indicating that U.S. consumption in the late 1990s was approximately 18 million barrels of oil per day. In the context of the U.S. energy market, East Span Project build alternatives have a minimal contribution to cumulative energy consumption measured in barrels of oil per day.

4.15.19 Dredging

Context

The regulatory context for the dredging cumulative impacts analysis is the Long-Term Management Strategy for the Placement of Dredged Materials in the San Francisco Bay Region (LTMS). The LTMS sets policies and addresses the cumulative impacts on in-Bay dredged material disposal. A NEPA environmental impact statement/CEQA programmatic environmental impact report for the LTMS was completed in 1999. This strategy document was cooperatively developed by the EPA, ACOE, State Water Quality Control Board, RWQCB, and BCDC. These agencies have also established an interagency Dredged Material Management office (DMMO) that is responsible for coordinating review of dredging activities and disposal of dredged materials from all projects in San Francisco Bay. Past trends have been in-Bay disposal of dredged materials, for example near Alcatraz Island. This disposal has adversely affected water quality, clarity, and aquatic species. Foreseeable trends, due to implementation of the LTMS, are a decrease in in-Bay disposal of dredge materials.

The geographic context for the cumulative impacts analysis is the San Francisco Bay region, consistent with the LTMS. Large-scale dredging for navigation purposes and to maintain berthing areas has occurred in the Bay for over 100 years. At present, an average of four million cubic meters (six million cubic yards) of sediments must be dredged each year to maintain safe navigation in San Francisco Bay.

The LTMS environmental document takes a regional approach to the impacts of dredging such as loss and degradation of water quality due to increased turbidity. (See Section 4.15.10 — Water Quality for a discussion of the types of cumulative impacts that can result from in-Bay work.)

Impacts Analysis

All East Span Project build alternatives would require the disposal of dredged material as a component of the construction scenario. Estimated volumes of dredging material

and a discussion of dredging activities and impacts are provided in Section 4.14.10 — Construction Excavation and Dredging.

Projects that will generate dredged materials are considered in LTMS estimates. The LTMS annual Low-, Mid-, and High-Range in-Bay dredged material volume estimates for San Francisco Bay (1995-2045) are 2,653,005; 3,486,370; and 4,533,810 cubic meters/year respectively (3,740,000, 4,560,000 and 5,930,000 cubic yards/year). These numbers are estimates of dredged material quantities and do not constitute allowable limits for in-Bay disposal. Conservatively, the Retrofit Existing Structure Alternative would constitute approximately 2.5 percent of the annual LTMS estimates (percentages calculated using annual project dredging volumes as a percentage of Low-Range dredged material volume estimates). All Replacement Alternatives would constitute approximately 16 percent of the annual LTMS volumes.

The LTMS Programmatic EIS/EIR reported the potential cumulative impacts of LTMS action alternatives. Action alternatives included combinations of in-Bay, deep ocean, and upland/wetland reuse strategies for disposal of dredged material. The LTMS cumulative impacts analysis reported potential for increases in air emissions from tugboats and truck trips, increases in volumes of waterborne transportation, changes in land use, and habitat conversion/modification related to upland/wetland reuse. Cumulative benefits of habitat restoration and reduced in-Bay disposal were also identified.

Reuse/disposal options for the dredged materials from the build alternatives are outlined in the East Span Project's Dredged Material Management Plan (DMMP) (see Appendix M). Beneficial reuse/disposal scenarios are proposed for the replacement alternatives, to the extent that upland/wetland reuse sites are available to accept dredged materials consistent with construction schedules and costs. This approach would be consistent with LTMS policies. Reuse/disposal options for the East Span Project are consistent with the trend for reducing the volume of in-Bay disposal of disposal of dredged material.

Based on consultation with DMMO member agencies during preparation of the DMMP, reuse/disposal options are available to receive East Span Project dredged materials that have been determined to be suitable for unconfined aquatic disposal. Placement of East Span Project dredged materials at locations (upland, ocean, or in-Bay) available to receive materials would be consistent with LTMS goals to limit in-Bay placement of dredged materials and would contribute to a beneficial cumulative impact of reducing in-Bay dredged material disposal.

4.16 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The No-Build Alternative would not directly involve the use of resources. The build alternatives would involve the commitment of a range of natural, physical, human, and fiscal resources.

The Retrofit Existing Structure Alternative would require approximately 9.3 square meters (100 square feet) of the Senior Officers' Quarters Historic District in order to expand the footing of Column YB2. The replacement alternatives would require right-of-way on both Yerba Buena Island and the Oakland Touchdown. The land used for the proposed project is considered an irreversible commitment during the time period that the land is used for a transportation facility. It should be noted that land in the vicinity of the existing bridge would become available once the bridge is dismantled.

All of the replacement alternatives would affect habitat areas, special aquatic sites, and vegetation to some extent. Mitigation measures would be implemented, but creation/restoration sites may not be in the project area.

Considerable amounts of fossil fuels, labor, and construction materials (such as cement, aggregate, steel) would be expended. It is estimated that 3.5 million barrels of oil would be used during construction of the Retrofit Existing Structure Alternative and over 6 million barrels of oil for the replacement alternatives. It is forecasted that average annual employment during construction would be 360 people for the Retrofit Existing Structure Alternative and 600 people for the replacement alternatives. Workers are expected to be drawn from the regional labor pool, with specialty trades generating demand from outside the Bay Area.

Additionally, large amounts of labor and natural resources are used in the fabrication and preparation of construction materials. These materials are generally not retrievable. However, they are not in short supply, and their use would not have an adverse effect upon continued availability of these resources.

The build alternatives would require a substantial expenditure of funds, which would not be retrievable. It is expected that the Retrofit Existing Structure Alternative would cost approximately $0.9 billion and the replacement alternatives would have a cost range of $1.5 to $1.65 billion, depending on final design.

The commitment of these resources is based on the concept that the Bay Area region would benefit from a seismically upgraded vehicular crossing. The benefits of a lifeline vehicular connection outweigh the commitment of these resources.

4.17 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

As described in Section 4.14, the East Span Project would result in temporary construction-related increases in noise, traffic congestion and delays, and air pollutants and would involve impacts to Waters of the U.S. and special aquatic sites (wetlands, sand flats, and eelgrass beds). In addition, the dismantling of the existing East Span represents the loss of a historic structure. The build alternatives may also impact land use patterns on YBI.

These and other short-term environmental impacts (i.e., "uses" of the environment) identified in Section 4.14 would be balanced by achieving improved seismic and traffic safety and the related project needs identified in Chapter 1. Maintaining a lifeline connection for emergency response, commerce, and the movement of goods and people would enhance long-term productivity in the event of an MCE.

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CHAPTER 5

CEQA STATUS AND FINDINGS

The SFOBB East Span Seismic Safety Project is exempt by statute from the requirements of the California Environmental Quality Act (CEQA) under California Streets and Highways Code (CSHC) Section 180.2 and CEQA Section 21080.

Sections 21000 through 21178.1 of the Public Resources Code make up the CEQA statutes. Section 21080 contains a list of projects that are generally identified as statutorily exempt; that is, they are granted exemption from CEQA by the state legislature. These are distinguished from other classes of projects listed in Section 21084 that may be found to be categorically exempt after some review.

CEQA Section 21080, subdivision (b) sets forth the types of activities that are excluded from CEQA, and paragraph (4) of this subdivision specifically includes actions necessary to prevent or mitigate an emergency. According to the CSHC, as amended, the structural modification of an existing highway structure or toll bridge (Section 180.2 [a]) and the replacement of a highway structure or toll bridge within, or immediately adjacent to, an existing right-of-way (Section 180.2 [b]) shall be considered to be activities under subdivision (b), paragraph (4).

In the current project, the Retrofit Existing Structure Alternative meets the definition in Section 180.2 (a) and the replacement alternatives meet the definition in Section 180.2 (b). All project alternatives are considered "specific actions necessary to prevent or mitigate an emergency" and are, therefore, statutorily exempt from CEQA. Some exemptions are complete exemptions from CEQA, and other exemptions apply to only part of CEQA requirements. The exemption of emergency actions is a complete exemption and does not require any environmental review under CEQA.

Appendix H of this FEIS contains the Notice of Exemption, pursuant to CEQA, that was filed with the State Clearinghouse and with the Clerks of the Counties of Alameda and San Francisco in the Fall of 1998. The placement of this notice in the FEIS is for the readers' reference; it does not constitute a new noticing procedure under CEQA, nor does this project require additional noticing under CEQA. This notice was previously published in the DEIS appendices for the readers' reference.

CHAPTER 6
SECTION 4(f) EVALUATION

6.1 INTRODUCTION

6.1.1 Section 4(f)

Section 4(f) of the Department of Transportation Act of 1966, codified in Federal law at 49 U.S.C. §303, declares that "[i]t 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 "[t]he 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 a 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 –

1) there is no prudent and feasible alternative to using that land; and

2) 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 (USDA) and Housing and Urban Development (HUD) in developing transportation projects and programs which use lands protected by Section 4(f).

In general, a Section 4(f) "use" occurs with a Department of Transportation-approved project or program when: 1) Section 4(f) land is permanently incorporated into a transportation facility; 2) there is a temporary occupancy of Section 4(f) land that is adverse in terms of the Section 4(f) preservationist purposes as determined by specified criteria (23 CFR §771.135[p][7]); and 3) 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).

Consultation with the Department of Agriculture (USDA) would occur whenever a project uses Section 4(f) land from the National Forest System. Consultation with HUD would occur whenever a project uses Section 4(f) land for/on which certain HUD funding had been utilized. Since neither of these conditions applies to the proposed project, consultation with USDA and HUD is not required.

6.1.2 Final Section 4(f) Evaluation

A draft Section 4(f) evaluation was circulated with the Draft Environmental Impact Statement (DEIS) for the San Francisco-Oakland Bay Bridge East Span Seismic Safety Project on September 24, 1998. After circulation of the DEIS, Section 4(f) was found to apply to two additional properties. Pursuant to CFR 771.135(m)(2), a separate and supplemental Section 4(f) evaluation was prepared to address these properties:

- The temporary occupancy of land from the Senior Officers' Quarters Historic District, a historic resource eligible for the National Register of Historic Places (NRHP), by the temporary construction detours for the replacement alternatives of the proposed project.

- The use of land from the proposed Gateway Park at the Oakland Touchdown by Replacement Alternative S-4. Gateway Park is a significant regional recreational resource being planned by the East Bay Regional Park District (EBRPD) as a future land use of part of the former Oakland Army Base (OARB) property, per designation by the Oakland Base Reuse Authority (OBRA).

The supplemental draft Section 4(f) evaluation also documented that Radio Beach, owned by the Port of Oakland (Port), is not a Section 4(f) resource and is not protected by the provisions of Section 4(f).

The supplemental draft Section 4(f) evaluation was sent to the Department of the Interior and the following interested agencies and organizations on June 29, 1999:

- Advisory Council on Historic Preservation
- United States Navy
- United States Coast Guard
- United States Army
- Oakland Base Reuse Authority
- Port of Oakland
- East Bay Regional Park District
- California Preservation Foundation
- National Trust for Historic Preservation
- Oakland Landmarks Preservation Advisory Board
- San Francisco Landmarks Preservation Advisory Board
- Treasure Island Reuse Authority
- City of Oakland
- California Department of Parks and Recreation

Comments received on the draft Section 4(f) evaluation are included with the letters commenting on the DEIS; responses to these comments are in Volume II, Section 1, of the FEIS. Comments on the supplemental draft Section 4(f) evaluation are in Volume II, Section 3, of the FEIS. Refer to the Section 4(f) correspondence index at the end of this final Section 4(f) evaluation.

6.1.3 Section 4(f) and Section 106 ("Use" versus "Adverse Effect")

One of the issues addressed in this evaluation concerns the application of Section 4(f) to historic resources. The consideration of historic resources under Section 4(f) differs from their consideration under Section 106 of the National Historic Preservation Act. Section 4(f) applies only to programs and projects undertaken by the U.S. Department of Transportation and only to publicly owned public parks, recreation areas, and wildlife refuges, and to historic sites on or eligible for the NRHP. For protected historic sites, Section 4(f) is triggered by the "use" or occupancy of a historic site by a proposed project. There is also the situation, though rare, in which a project does not actually permanently incorporate land from a historic site, but because of its proximity impacts to the historic site, is determined by the U.S. Department of Transportation to substantially impair the qualities that made the historic site eligible for the NRHP. This is referred to as a "constructive use." In addition, when a temporary occupancy of Section 4(f) land meets specified conditions (23 CFR 771.135[p][7]), the occupancy is considered so minimal that it does not constitute a "use" within the meaning of Section 4(f).

Section 106 is a different requirement that applies to any Federal agency and addresses direct and indirect "effects" of an action on historic properties. Section 106 evaluates "effects" on a historic site, while Section 4(f) protects a historic site from "use" by a project. Therefore, even though there may be an "adverse effect" under Section 106 because of the effects upon the site, the provisions of Section 4(f) are not triggered if the project would not result in an "actual use" (permanent or certain temporary occupancy of land) or a "constructive use" (substantial impairment of the features or attributes which qualified the site for the NRHP).

With regard to archaeological sites, Section 4(f) applies to all archaeological sites on or eligible for inclusion on the NRHP, except those that are important chiefly because of what can be learned by data recovery and have minimal value for preservation in place (23 CFR §771.135[g][2]).

6.2 PROPOSED ACTION — PROJECT NEED AND DESCRIPTION

The proposed project is in San Francisco and Alameda Counties, California (see Figure 2-1 in Appendix A). The project would improve the seismic performance of the East Span of the San Francisco-Oakland Bay Bridge (SFOBB) by retrofitting the existing span or by replacing it with a new structure. The proposed project is limited to the East Span of the SFOBB, between Oakland and Yerba Buena Island (YBI) (see Figure 2-2 in Appendix A); the West Span, between YBI and San Francisco, is already being retrofitted (see Section 1.3.5 — Other SFOBB Seismic Safety Projects for additional information). The following discussion presents the need for the project and the project description.

6.2.1 Need for Project

The existing East Span of the SFOBB must be replaced or retrofitted because:

- It is not expected to withstand a Maximum Credible Earthquake (MCE) on the San Andreas or Hayward faults;
- It does not meet lifeline criteria for providing emergency relief access following an MCE; and
- It does not meet current operations and safety design standards.

Each of these needs is described in greater detail in Chapter 1 of this FEIS.

6.2.2 Description of the East Span Seismic Safety Project

The proposed seismic safety project includes full consideration of five alternatives briefly described below. The alternatives include a No-Build Alternative, a Retrofit Existing Structure Alternative, and three replacement alternatives. (Figure 2-3 in Appendix A shows all the alignments for the replacement alternatives; the No-Build Alternative and the Retrofit Existing Structure Alternative would both be on the alignment of the existing bridge.)

No-Build

This alternative would retain the existing SFOBB East Span. It would retain the existing bridge alignment. Under this alternative, the East Span would not withstand an MCE. As a result, this alternative would not provide a lifeline connection to carry emergency relief access after an MCE. The No-Build Alternative provides a baseline for comparison with the other alternatives. The No-Build Alternative includes the East Span Interim Seismic Retrofit Project as a completed project (see Section 1.3.6 of the FEIS for additional information).

Replacement Alternative N-6 (Preferred Alternative)

Replacement Alternative N-6 is the Preferred Alternative, as set forth in Section 6.2.3, below. It would construct a new bridge north of the existing East Span and dismantle the existing structure. The new structure would withstand an MCE and provide a lifeline connection. The new structure would also meet current roadway and design standards for operations and safety. A new transition structure would separate the double-decked lanes entering and exiting the YBI Tunnel into two parallel structures. The twin structures would follow an alignment to the north of the existing East Span. The structures would reach the Oakland shore along the northern edge of the Oakland Touchdown, where they would conform to the existing traffic lanes to the west of the Toll Plaza. The northerly limit of this alignment has been set to minimize intrusion into portions of the Bay where geologic conditions increase the complexity and cost of constructing bridge columns.

Replacement Alternative N-2

Replacement Alternative N-2 would construct a new bridge north of the existing East Span and dismantle the existing structure. The new structure would withstand an MCE and provide a lifeline connection. The new structure would also meet current roadway and design standards for operations and safety. A new transition structure would separate the double-decked lanes entering and exiting the YBI Tunnel into two parallel structures. The twin structures would closely parallel the existing bridge alignment and reach the Oakland shore along the northern edge of the Oakland Touchdown, where they would conform to the existing traffic lanes to the west of the toll plaza.

Replacement Alternative S-4

Replacement Alternative S-4 would construct a new bridge south of the existing East Span and dismantle the existing structure. The new structure would withstand an MCE and provide a lifeline connection. The new structure would also meet current roadway and design standards for operations and safety. A new transition structure would separate the double-decked lanes entering and exiting the YBI Tunnel into two parallel structures that would turn to the south and then back to the Oakland shore in an alignment to the south of the EBMUD sewer outfall. The parallel structures would reach the Oakland shore to the south of the existing East Span and would conform to the existing traffic lanes to the west of the toll plaza. The alignment would avoid crossing the underground EBMUD sewer outfall within the Bay, but it would cross the outfall on land after reaching the Oakland Touchdown area.

Retrofit Existing Structure

The Retrofit Existing Structure Alternative would also retain the alignment of the existing bridge. Each deck section would also remain the same: five lanes, each about 3.5 meters (11.7 feet) wide, with no roadway shoulders. This cross-section does not meet current roadway standards. This alternative would retrofit the existing SFOBB East Span to prevent collapse following an MCE; however, the bridge would sustain such damage that it would not provide a lifeline route for post-earthquake recovery and it would not reopen shortly after an MCE for car, bus, and truck traffic. Although substantial modifications to the cantilever section are proposed as part of the Retrofit Existing Structure Alternative, it is, nevertheless, anticipated that the cantilever section would experience substantial damage and require extensive reconstruction or replacement following an MCE. If damage is such that reconstruction of the cantilever section is feasible, this may require complete closure of the East Span for six months to one year. If, however, damage were sufficiently severe that replacement becomes necessary, the East Span would be completely closed for a substantially longer period of time.

Temporary Detours on Yerba Buena Island

Temporary detours would be required on YBI to carry traffic during construction of any of the replacement alternatives. The temporary detours would be operational for approximately 2 years. The period from the beginning of construction to the end of dismantling would be approximately 4 years. Their purpose would be to reroute traffic around a portion of the existing bridge on YBI to minimize traffic impacts while allowing dismantling of that portion of the existing bridge on YBI to allow construction and tie-in of a new permanent structure.

Configurations and locations of the temporary detours were evaluated in an effort to avoid or minimize impacts to U.S. Navy and U.S. Coast Guard (USCG) facilities. Configurations were analyzed for construction feasibility, impacts to resources on YBI, and traffic operational impacts. Only one temporary detour remains under consideration; it is referred to as the north-south option. The north-south option would build a westbound temporary structure to the north and an eastbound temporary structure to the south of the existing bridge; this option would be used for all three replacement alternatives. (The foundations of this temporary detour are shown schematically in Figures 6-1, 6-2, and 6-3 while photo simulations of the detour structures are shown in Figures 6-13 and 6-14 in Appendix A.)

Temporary Detours No Longer Under Consideration. Two other temporary detours were previously considered and are no longer under consideration. They include constructing eastbound and westbound temporary detours to the north of the existing bridge (north-only option); and constructing eastbound and westbound temporary detours to the south of the existing bridge (south-only option). The north-only temporary detours would result in traffic safety concerns and additional uses of historic resources. The south-only temporary detours for Replacement Alternatives N-2 and N-6 would result in access concerns as a result of bridge closure for a few weeks. The south-only temporary detour for Replacement Alternative S-4 would result in traffic safety concerns. For these reasons, the north-only and south-only temporary detours are no longer being considered.

6.2.3 Preferred Alternative

Replacement Alternative N-6, described above, is the Preferred Alternative for a number of reasons, including avoidance of Section 4(f) resources. Reasons not related to Section 4(f) resources are listed immediately below. The ways in which Replacement Alternative N-6 avoids Section 4(f) resources are discussed in Sections 6.4 and 6.5 of this final Section 4(f) evaluation.

Replacement Alternative N-6:

- Is consistent with OBRA's designation of part of the OARB property as a proposed park;
- Is consistent with EBRPD's concepts for the proposed Gateway Park, a Section 4(f) resource;
- Minimizes conflicts with the USCG facilities;
- Avoids conflicts with the East Bay Municipal Utility District's facilities and operations;
- Provides easier access to bedrock to construct the main span tower for the replacement bridge;

- Provides improved drivers' views of the San Francisco skyline and panorama of East Bay hills;
- Has the general alignment and design variations of the regionally preferred option as expressed by the Metropolitan Transportation Commission (MTC); and
- Was identified as the Least Environmentally Damaging Practicable Alternative (LEDPA) pursuant to the Clean Water Act, based on consultation with and concurrence from the Army Corps of Engineers and the Environmental Protection Agency (see Appendix F of the FEIS for additional information).

6.3 DESCRIPTION OF SECTION 4(f) RESOURCES USED BY PROJECT ALTERNATIVES

Three Section 4(f) resources would be used by alternatives of the proposed project: the SFOBB and its contributing components; the Senior Officers' Quarters Historic District on YBI; and the proposed Gateway Park at the Oakland Touchdown.

6.3.1 The San Francisco-Oakland Bay Bridge

The East Span of the SFOBB and some of its contributing components would be used by the retrofit alternative and all replacement alternatives of the proposed project.

The Entire San Francisco-Oakland Bay Bridge

The entire SFOBB, both East and West Spans, is 13.2 kilometers (8.2 miles) long from Fifth Street in downtown San Francisco to the SFOBB Toll Plaza in Oakland. It includes various bridge structures and ancillary buildings in San Francisco, on YBI and at the Oakland Touchdown, and it includes a double-deck tunnel on YBI. (Figure 1-1 in Appendix A shows a schematic layout of the entire bridge.) The entire SFOBB was determined eligible for listing on the NRHP in 1983, and as such, it is a historic property protected by the provisions of Section 4(f). It is a toll bridge owned and operated by Caltrans. It crosses San Francisco Bay and links the East Bay with the City and County of San Francisco (CCSF) and the San Francisco Peninsula. The double-deck roadway is a designated Interstate Freeway (Interstate 80) with five vehicle lanes on each deck which together carry 272,000 vehicles per day.

In 1931 the State of California established by law the California Toll Bridge Authority, with power to buy or build bridges and borrow money against their prospective tolls. The SFOBB was designed and constructed for the California Toll Bridge Authority by the San Francisco-Oakland Bay Bridge Division, California Department of Public Works. It opened to traffic in November of 1936 as a primary state highway, maintained by the Division of Highways (which later became Caltrans). The SFOBB is significant as a major work of civil engineering for its role in shaping Bay Area transportation patterns and for its association with the important engineers and architects who designed it.

Historic resources that are listed on the NRHP and resources that are eligible for it are viewed similarly under the provisions of Section 4(f) in that all such resources are protected by Section 4(f). Listing on the NRHP, while conferring a certain distinction,

does not result in additional protections to historic resources under the provisions of Section 4(f).

At the time the SFOBB was first opened in 1936, it held many world records. It was the greatest bridge in the world for its cost, length, quantities of steel and concrete, weight, depth, and number of columns, the size of the bore of its tunnel on YBI, and the versatility of its engineering. Seven of its columns were deeper than any others in the world. New technologies were developed to construct the foundations. The submarine work was the greatest underwater engineering task ever undertaken. The steel for the superstructure was said to constitute the largest steel order ever placed.

The West Span and the East Span of the SFOBB are distinctly different bridge structures linked by the tunnel on YBI. The West Span consists of two double-deck suspension bridges joined to a common central anchorage in the Bay between San Francisco and YBI. The anchorages of one suspension bridge are in San Francisco and at the Center Anchorage (Column W4), while the anchorages for the other suspension bridge are at the Center Anchorage (Column W4) and on YBI. In contrast, the East Span consists of trusses, as discussed below.

The East Span of the SFOBB

The East Bay truss/cantilever span (East Span) of the SFOBB connects YBI to the Toll Plaza area on the Oakland shore (see Figure 2-2 in Appendix A). The East Span and the contributing components adjacent to it comprise a substantial part of the SFOBB historic resource. The East Span consists of a series of steel trusses with a cantilever truss system spanning the main navigation opening near YBI. The east viaduct on YBI is a bridge structure that connects the East Span to the tunnel through the island. The east viaduct and the tunnel are contributing components to the historic resource.

Contributing Components Associated with the East Span

Four buildings associated with the East Span are contributing components of the SFOBB.

On YBI, just east of the tunnel, a small garage and electrical substation are immediately adjacent to the bridge on the north side. The buildings are utilitarian concrete structures. They were built in the late 1930s. They are shown in relation to the replacement alternatives on Figures 6-4, 6-5, and 6-6 in Appendix A.

At the Oakland Touchdown, there are two electrical substations adjacent to the eastern end of the bridge (see Figures 6-7 and 6-8 in Appendix A). They are eligible for the NRHP as contributing components of the SFOBB. One of these, the Caltrans Substation, is a utilitarian concrete structure built in the late 1930s, similar to the substation on YBI. The other structure, the Key Pier Substation, was constructed in 1925-26 as part of the Key System Railway. It is a tall concrete building with a pyramidal roof and skylight. It is associated with the bridge as the substation that provided power to the rail lines that were carried on the lower deck of the bridge until the rail lines were removed in the 1950s. It is also individually eligible for the NRHP at the local level of significance under Criterion A as a rare surviving component of the

historically significant Key System railway, which was an important East Bay transit system in the early 20th century.

6.3.2 The Senior Officers' Quarters Historic District

The Senior Officers' Quarters Historic District would be permanently used by the Retrofit Existing Structure Alternative and temporarily used by all replacement alternatives of the proposed project.

The Senior Officers' Quarters Historic District was identified as a property eligible for the NRHP in a historic architecture survey of YBI and Treasure Island, carried out by the Navy in 1997. The Senior Officers' Quarters Historic District is eligible for the NRHP under Criteria A and C, in the areas of military history and architecture. These criteria may be applied to historic districts as well as individual historic properties; in general terms, a historic district contains a number of historic buildings, structures, or sites that are united historically, culturally, or architecturally, and that as an assemblage meet the NRHP criteria of significance.

The Senior Officers' Quarters Historic District is comprised of Quarters 1 through 7 and three associated garages (Buildings 83, 205, and 230) (see Figures 6-4, 6-5, and 6-6 in Appendix A). The boundary of the District is depicted in Figure 6-12 in Appendix A. The seven residences are all of wood frame construction, with two full floors and dormered attic stories. They were constructed between 1900 and 1903 in the Classical Revival style. Quarters 1, the largest and most elaborate of these, was listed on the NRHP in 1991. Buildings 83 and 230 are garages with second floor living quarters, constructed in 1918 and 1944, respectively. Building 205 is a single-story garage constructed in 1936. The district is significant for its association with the Naval Training Station on YBI and as a distinctive ensemble of Classical Revival residences.

The District Record prepared by the U.S. Navy for the historic district states that "[b]oundaries were determined to include the historic buildings of the area, and the landscape elements that tie them together." The boundaries of this roughly triangular historic district are the road to the west of Quarters 5 and 6, the lower edge of the lawn area to the east, and a line up the hill behind Quarters 1 that encompasses the formal gardens between Quarters 1 and Building 230.

6.3.3 Gateway Park

The Gateway Park would be permanently used by Replacement Alternative S-4.

The proposed Gateway Park is located at the Oakland Touchdown (see Figure 6-9 in Appendix A). It would be developed on land that is part of the former OARB, which is currently involved in the base closure process. The OBRA is the designated local redevelopment authority for the base. OBRA's Reuse Plan designates 5.9 hectares (14.7 acres) at the westernmost portion of the Army Base on the Oakland Touchdown as the site of a proposed public access shoreline park. It further designates the EBRPD as the agency that would develop the park. EBRPD proposes generally passive recreational activities to be developed in the park, including but not limited to viewing the Bay, picnicking, and bicycling.

In a letter commenting on the project Draft Environmental Impact Statement, the Department of the Interior found that "the S-4 Alternative Alignment impacts the envisioned park, and other prudent and feasible alternatives exist to this alternative." Department of the Interior recommended that the matter be pursued in consultation with authorities that may be concerned about potential project impacts to park and recreation resources (see correspondence from the Department of the Interior, December 18, 1998, in Appendix G of the FEIS).

In a meeting held March 11, 1999, the FHWA and Caltrans solicited the views on this proposed park from staff of the EBRPD, the Port, the City of Oakland and the National Park Service (NPS). Each agency described the importance of the proposed Gateway Park as a regionally significant recreational facility, providing a gateway to the East Bay.

In early 1999, the MTC committed to allocate $120,000 to the EBRPD for fiscal year 1999-2000. The purpose of the allocation was for Gateway Park project planning. MTC has stated that the Gateway Park is envisioned as a lush greenway that would anchor the Oakland Touchdown of the SFOBB and transform the nondescript Bay frontage at that location into a natural haven.

The proposed public park is on publicly owned land that has been designated for park development by the OBRA, the designated local redevelopment authority for the OARB. The proposed park has received the support of the local community as well as interested local, regional, state, and federal agencies. EBRPD has taken the responsibility for being the lead agency to further develop and manage the park. The proposed Gateway Park is a Section 4(f) resource.

6.4 USE OF SECTION 4(f) RESOURCES BY PROJECT ALTERNATIVES

6.4.1 East Span of the SFOBB and Its Contributing Components

Potential Section 4(f) uses by the project are discussed below as they relate to the East Span of the SFOBB and its contributing structures. The No-Build Alternative would not use this Section 4(f) resource.

Retrofit Existing Structure Alternative

This alternative would retrofit the existing East Span of the bridge from Oakland to the east tunnel portal on YBI. The work would include the addition of new piles and pile caps at many columns, construction of two new columns at the main span of the cantilever truss, and concrete encasement of several of the existing steel piers. A new edge truss would also be added to the cantilever section, from the base of the lower deck to the bottom of the upper deck. This alternative would not alter the garage and substation on YBI or the substations in Oakland that are contributing components of the bridge. (Figures 6-10 and 6-11 in Appendix A show before and after simulations of the Retrofit Existing Structure Alternative looking at the cantilever section.)

Evaluation of Section 4(f) Use by the Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would result in a Section 4(f) use of this historic bridge, because it would adversely affect the historical integrity of the bridge by altering elements of the bridge's design and materials, both of which contribute to the bridge's status as a NRHP eligible property. For more information about "use" under Section 4(f) and "adverse effect" under Section 106 of the National Historic Preservation Act, see Section 6.1.3.

Replacement Alternatives

All of the replacement alternatives include dismantling of the existing East Span as well as removal of the two contributing buildings (the garage and electrical substation) on YBI. The replacement alternatives would not alter or demolish the Key Pier Substation or the other contributing substation at the Oakland Touchdown.

Evaluation of Section 4(f) Use by the Replacement Alternatives. Dismantling of the existing East Span and removal of two contributing buildings would result in a Section 4(f) use of the historic resource.

6.4.2 Senior Officers' Quarters Historic District

The project's Section 4(f) use of the Senior Officers' Quarters Historic District is discussed below. The No-Build Alternative would not use this Section 4(f) property.

Retrofit Existing Structure Alternative

The Retrofit Existing Alternative would expand the concrete column footings and encase Columns YB2 through YB4 on YBI (in Appendix A, see Figure 6-16; Figure 6-15 shows the existing bridge for comparison). The existing columns are outside the historic district boundary. The concrete blocks of the existing column footings extend above the ground level; the part above ground level is about 2.4 meters (8 feet) wide and about 2.7 meters (9 feet) long; the tops of the column footings vary in height above ground level. At Column YB2, the column footing extends about 3 meters (10 feet) above the ground level. Expanding the footing of Column YB2 would incorporate land from the historic district into the transportation facility by extending the concrete block of the footing into the historic district boundary. The above-ground portion of the expanded portion of the column footing would be 6.1 meters (20 feet) wide, 8.5 meters (28 feet) long, and about 2.1 meters (7 feet) high. The above-ground portion of the expanded column footing that would extend into the historic district boundary would measure 6.1 meters (20 feet) wide by 1.5 meters (5 feet) long, and it would be about 2.1 meters (7 feet) high. This would incorporate about 9.3 square meters (100 square feet) of the historic district into the transportation facility. The work would remove adjacent vegetation consisting chiefly of naturalized berry vines; it would also relocate part of a staircase next to the column. The staircase is not itself historic and is not a contributing element to the historic district; it leads from the Parade Grounds up the hill to Macalla Road, and for most of its length it is outside the historic district and beneath the existing bridge. It provides access for USCG personnel between their facility at the shoreline and buildings and a bus stop at higher elevations on the island.

The Retrofit Existing Structure Alternative would not alter the alignment of the structure as a whole. At its closest point as measured in plan view, the structure for the Retrofit Existing Structure Alternative would still be the same horizontal distance from Quarters 1 as the existing structure, or 48 meters (157 feet). The bridge deck would remain about 36 meters (120 feet) above the level of the historic district.

Evaluation of Section 4(f) Use by the Retrofit Existing Structure Alternative. The expanded footing of Column YB2 would cause a Section 4(f) use, since land from the historic district would be permanently incorporated into the transportation facility.

Temporary Detours for Replacement Alternatives

All of the replacement alternatives require the use of temporary detours to temporarily carry traffic during construction on YBI. The only temporary detour still being considered is the north-south temporary detour. The temporary detours and their support columns would pass to the south of the boundary of Quarters 1, the nearest historic building in the historic district, but some support columns would be within the historic district boundaries. For all replacement alternatives, the supports for the temporary detours would be in the near viewshed of Quarters 1 for the length of time the temporary detours would be in place.

The north-south temporary detour for Replacement Alternative N-2 would result in a temporary detour passing above a portion of the Senior Officers' Quarters Historic District. At its closest point, the structure would be about 36 meters (120 feet) above the historic district, and about 2 meters (7 feet) horizontally to the south of Quarters 1, the nearest historic building in the historic district (see Figures 6-1 [plan view] and 6-13 [simulation] in Appendix A). The temporary detours would not remove any historic buildings. Approximately four column footings would be constructed within the grounds of the historic district in the lawn and vegetation downhill from Quarters 1, as shown in Figure 6-1 in Appendix A. Footing locations shown in Figure 6-1 are schematic; the locations would be refined during final design. The temporary detours would not restrict access to the historic district or Quarters 1.

The north-south temporary detour for Replacement Alternative N-6 would result in a temporary detour temporarily passing above a portion of the Senior Officers' Quarters Historic District. At its closest point, the structure would be about 36 meters (120 feet) above the historic district and about 2 meters (7 feet) horizontally to the south of Quarters 1, the nearest historic building in the historic district (see Figures 6-2 [plan view] and 6-13 [simulation] in Appendix A). The temporary detour would not remove any historic buildings. Approximately six column footings would be constructed in the lawn and vegetation downhill from Quarters 1, as shown in Figure 6-2 in Appendix A. Footing locations shown in Figure 6-2 in Appendix A are schematic; the locations would be refined during final design. The temporary detour would not restrict access to the historic district or Quarters 1.

The north-south temporary detour for Replacement Alternative S-4 would result in a temporary detour passing above the Senior Officers' Quarters Historic District. At its closest point, the structure would be about 36 meters (120 feet) above the historic

district and about 5 meters (16 feet) horizontally to the south of Quarters 1, the nearest historic building in the historic district (see Figures 6-3 [plan view] and 6-14 [simulation] in Appendix A). The temporary detour would not remove any historic buildings. Approximately four column footings would be constructed in the lawn and vegetation downhill from Quarters 1, as shown in Figure 6-3 in Appendix A. One other column, on the walkway to the east of Quarters 1, would also be partially within the historic district; although this column would be partially within the historic district, it would be outside the boundary of Quarters 1 itself. Footing locations are schematic; the locations would be refined during final design. The temporary detour would not restrict access to the historic district or Quarters 1.

Evaluation of Section 4(f) Use by Temporary Detours. Temporary detours would be required to build any of the replacement alternatives. The potential Section 4(f) use of the Senior Officers' Quarters Historic District by the temporary detours was evaluated. Section 4(f) use by permanent structures is discussed below. As outlined in 23 CFR §771.135(p)(7), when the following conditions are satisfied, a temporary occupancy of land is so minimal that it does not constitute a Section 4(f) use within the meaning of Section 4(f):

1. Duration must be temporary, i.e., less than the time needed for construction of the project, and there should be no change in ownership of the land;

2. Scope of the work must be minor, i.e., both the nature and the magnitude of the changes to the Section 4(f) resource are minimal;

3. There are no anticipated permanent adverse physical impacts, nor would there be interference with the activities or purposes of the resource, on either a temporary or permanent basis;

4. The land being used must be fully restored, i.e., the resource must be returned to a condition which is at least as good as that which existed prior to the project; and

5. There must be documented agreement of the appropriate federal, state, or local officials having jurisdiction over the resource regarding the above conditions.

Pursuant to 23 CFR §771.135(p)(7), the temporary detours for any of the replacement alternatives would be in place for up to 45 months; this is less than the time needed for construction of the project, which would be approximately five years. The scope of work involves the placement of columns and footings in landscaped or paved areas of the Senior Officers' Quarters Historic District. The columns would support five-lane wide temporary structures overhead.

Placement of the columns would involve some excavation within landscaped areas of the Senior Officers' Quarters Historic District, consisting of lawn and shrubbery. The excavation would result in minimal changes to the historic resource. The architecture of this historic district and its association with military history, the attributes that qualify it for the NRHP, would remain unchanged. There are no anticipated permanent adverse physical impacts from the temporary placement of columns and footings within

the grounds of the historic district. The land temporarily occupied by these columns and footings within the historic district would be fully restored as part of the project, including replacement planting and restoring the ground to its original condition. The temporary detours required for the replacement alternatives appear to meet the first four conditions outlined in 23 CFR §771.135(p)(7) for minimal occupancy of land.

In the draft Section 4(f) evaluation circulated with the DEIS, it had been assumed that the SHPO, the official having jurisdiction over historic resources, would agree with the first four criteria for minimal occupancy of land. Based on this assumption, it was determined that the temporary detours would not result in a Section 4(f) use. It was acknowledged, however, that consultation with the SHPO could result in a different outcome, requiring that this issue be revisited. Caltrans and the FHWA consulted with the SHPO to seek its agreement with the first four conditions for minimal occupancy pursuant to 23 CFR §771.135(p)(7)(v). The SHPO declined to agree or disagree regarding these conditions. Absent the agreement of the officials having jurisdiction regarding the first four criteria for minimal occupancy, FHWA has determined that the temporary detours for all replacement alternatives would result in a Section 4(f) use of the Senior Officers' Quarters Historic District. A supplemental draft Section 4(f) evaluation was prepared and circulated for review to address this Section 4(f) resource, as discussed in Section 6.1.2 of this final Section 4(f) evaluation. Comments were received on the supplemental draft Section 4(f) evaluation. Comments and responses are in Volume II, Section 3 of this FEIS.

Permanent Structures of Replacement Alternatives

The permanent structures for Replacement Alternative N-2 would be about 8 meters (26 feet) northwest of the existing bridge in the area of the historic district (in Appendix A, see Figure 6-17; Figures 6-15 and 6-16 show the existing bridge and a simulation of the Retrofit Existing Structure Alternative for comparison). The permanent structure for Replacement Alternative N-2 would extend above the southeast corner of the Senior Officers' Quarters Historic District. The bridge structure of Replacement Alternative N-2 would be built at the same elevation as the existing structure, a minimum of about 36 meters (120 feet) above the historic district. Replacement Alternative N-2 would span lawn and shrubbery, supported by bridge columns outside of the historic district. At its closest point, the new bridge structure of Replacement Alternative N-2 would be 40 meters (131 feet) horizontally from Quarters 1, the nearest historic building in the historic district. The existing bridge is 48 meters (157 feet) horizontally from Quarters 1 at the closest point, so this alternative would be 8 meters (26 feet) horizontally closer to Quarters 1 than the existing bridge.

The permanent structures for Replacement Alternative N-6 would be about 12 meters (39 feet) northwest of the existing bridge in the area of the historic district (in Appendix A, see Figure 6-17; Figures 6-15 and 6-16 show the existing bridge and a simulation of the Retrofit Existing Structure Alternative for comparison). As in the discussion of Replacement Alternative N-2 above, the permanent structure for Replacement Alternative N-6 would be about 36 meters (120 feet) above the southeast corner of the historic district, spanning lawn and shrubbery, and supported by bridge columns outside of the historic district. At its closest point, the new bridge structure would be 36 meters (118 feet) horizontally from Quarters 1, the nearest historic building in the

historic district. Therefore, this alternative would be 12 meters (39 feet) closer to Quarters 1 than the existing bridge.

The permanent structures for Replacement Alternative S-4 would be slightly farther away from the historic district than the existing bridge (in Appendix A, see Figure 6-18; Figures 6-15 and 6-16 show the existing bridge and a simulation of the Retrofit Existing Structure Alternative and northern replacement alternatives for comparison). The permanent structures would not span the historic district. At its closest point, the new bridge structure would be 54 meters (177 feet) horizontally from Quarters 1, the nearest historic building in the historic district. Therefore, this alternative would be 6 meters (20 feet) farther away from Quarters 1 than the existing bridge.

Summary of Distances from Project Alternatives to Quarters 1. Below is a table summarizing the horizontal and vertical distances from the bridge to Naval Quarters 1 (the Nimitz House) at the closest point for each alternative. Of the historic buildings in the Senior Officers' Quarters Historic District, Naval Quarters 1 is the closest one to the project alternatives. The vertical distances are measured from the bridge to the ground directly beneath the bridge at the closest horizontal distance to Quarters 1; none of the temporary or permanent structures for any build alternative actually span Quarters 1. The table is provided to assist in understanding the locations of the project alternatives in relation to Quarters 1.

Alternative	Approximate Horizontal Distance to Quarters 1 at the Closest Point	Approximate Vertical Distance to the Closest Point on the Ground Near Quarters 1
Retrofit Existing Structure Alternative	48 meters (157 feet)	37 meters (120 feet)
Replacement Alternative N-2 no	40 meters (131 feet)	37 meters (120 feet)
Replacement Alternative N-6 *	36 meters (118 feet)	37 meters (120 feet)
Replacement Alternative S-4	54 meters (177 feet)	37 meters (120 feet)
Temporary detours for any replacement alternative	2 meters (7 feet)	37 meters (120 feet)

Source: Caltrans, November 2000.

Evaluation of Section 4(f) Use by Permanent Structures of Replacement Alternatives. An "actual" Section 4(f) use would not occur as a result of the permanent structures because land from the historic district would not be permanently incorporated into the new bridge facility. Future maintenance activities on the portion of the bridge spanning the historic district by Replacement Alternative N-2 or N-6 would be addressed in a new construction and maintenance agreement executed with the property owner (currently the Navy) for the portion of the bridge traversing the historic district. The design of the permanent replacement structure (including the location of the bridge columns and footings outside of the historic district) and the required bridge maintenance activities to be addressed in the new

construction and maintenance agreement would not result in a permanent loss of use of property within the historic district.

The proximity impacts of the replacement alternatives were evaluated to determine whether they were so severe that the protected attributes that qualify the historic district for the NRHP are substantially impaired, i.e., to determine whether there would be a "constructive" Section 4(f) use. Based on this evaluation, it was determined that there would be no "constructive" Section 4(f) uses under the following potential proximity impacts: noise, views, access, and vibration. Therefore, the attributes that qualify the historic district for the NRHP, its association with military history and the architecture of its historic buildings, would not be substantially impaired by proximity impacts of any of the replacement alternatives.

6.4.3 Gateway Park

OARB is currently involved in the base closure process. The OBRA's Draft Final Reuse Plan designates 5.9 hectares (14.7 acres) at the westernmost end of the former OARB for a Public Benefit Conveyance to the EBRPD for a future park (see Figure 6-9 in Appendix A).

Retrofit Existing Structure Alternative

The Retrofit Existing Structure Alternative would be built within existing State right-of-way. It would not incorporate any land from the 5.9-hectare (14.7-acre) proposed park into the transportation project (see Figure 6-19 in Appendix A). It would not result in an actual Section 4(f) use of the proposed Gateway Park. At its closest point, the transportation facility would be 28 meters (92 feet) from the boundary of the proposed park property.

Proximity Impacts. The projected traffic noise levels at the park resulting from the Retrofit Existing Structure Alternative would be the same as for the No-Build Alternative, since the roadway location and configuration would remain the same. Projected noise levels from both the No-Build Alternative and the Retrofit Existing Structure Alternative would be the same as existing noise levels. Since the existing condition and the No-Build Alternative result in the same noise levels as the Retrofit Existing Structure Alternative in the area proposed for park use, no noise impacts to the proposed park are attributable to the Retrofit Existing Structure Alternative. There would be no constructive use of the proposed park from the Retrofit Existing Structure Alternative as a result of noise.

The proposed park would be implemented following construction of the East Span Project. A transportation facility exists at the Oakland Touchdown now, and when the park is implemented, its setting would include the transportation facility. The park planning that has taken place to date includes interagency coordination regarding ways to enhance the relationship of the transportation facility to the proposed park. The transportation facility would not substantially impair important aesthetic features or attributes of the proposed park. The operation of the transportation facility under the Retrofit Existing Structure Alternative would not restrict access to the proposed park.

The Retrofit Existing Structure Alternative would not result in an actual or a constructive use of the proposed Gateway Park.

Replacement Alternatives N-2 and N-6

Replacement Alternatives N-2 and N-6 have the same location and configuration at the Oakland Touchdown. They would be built within existing State right-of-way and right-of-way from the Port of Oakland. These alternatives would not incorporate any land from the 5.9-hectare (14.7-acre) proposed park into the transportation project (see Figure 6-19 in Appendix A). At the closest point, the transportation facility would be 46 meters (151 feet) from the boundary of the proposed park property for both of these alternatives.

Proximity Impacts. Existing noise levels range from 65 dBA at the eastern end of the proposed park land to 74 dBA near the western end. The projected traffic noise levels at the park resulting from Replacement Alternatives N-2 and N-6 would range from 67 dBA at the eastern end of the proposed park land to 70 dBA near the western end. The FHWA noise abatement criteria define 67 dBA as the threshold for traffic noise abatement consideration for parks.

At the eastern end of the proposed park, there would be a 2 dBA increase in noise levels over the existing condition. The projected noise level of 67 dBA is equal to the noise abatement threshold of 67 dBA established for parks. Since the federal noise abatement criteria are not exceeded, changes in noise levels at the eastern end of the proposed park would not result in a constructive use of the park. Near the western end of the proposed park, projected noise levels of 70 dBA for Replacement Alternatives N-2 and N-6 would exceed the threshold by 3 dBA; however, noise levels would also be reduced by 3 to 6 dBA from existing noise levels for the No-Build Alternative. Since Replacement Alternatives N-2 and N-6 would result in noise levels 3 to 6 dBA lower than they would be if the project were not implemented, changes in noise levels near the western end of the proposed park would not result in a constructive use of the future park.

The proposed park would be implemented following construction of the East Span Project. A transportation facility exists at the Oakland Touchdown now, and when the park is implemented, its setting would include the transportation facility. The park planning that has taken place to date includes interagency coordination regarding ways to enhance the relationship of the transportation facility to the proposed park. The transportation facility would therefore not substantially impair important aesthetic features or attributes of the proposed park. The operation of the transportation facility under either Replacement Alternative N-2 or N-6 would also not restrict access to the proposed park.

Replacement Alternatives N-2 and N-6 would not result in an actual or a constructive use of the proposed Gateway Park.

Replacement Alternative S-4

Replacement Alternative S-4 would be built within existing State right-of-way and right-of-way from the OARB. It would incorporate approximately 3 hectares (7.4 acres) of

the 5.9-hectare (14.7-acre) proposed park into the transportation project (see Figure 6-19 in Appendix A). This would reduce the size of the proposed park by one-half. The remaining area would accommodate the generally passive recreational activities proposed for the park, including but not limited to viewing the Bay, picnicking, and bicycling. However, the remaining land designated for park purposes would be at the greatest distance from the western end of the Oakland Touchdown. Replacement Alternative S-4 would incorporate much of the westernmost end of the park property, where views of the Bay to the south and west are the most dramatic, and where the presence of a park would most effectively enhance the experience of landfall for bridge users and for park visitors. The park's reduced size and location as a result of Replacement Alternative S-4 would therefore limit its intended function as a regionally significant recreational area and a gateway to the East Bay. Replacement Alternative S-4 would also place the transportation facility immediately adjacent to the remaining park land, thereby increasing expected noise levels in the park. For this alternative, views of the Bay from the park would be primarily to the south; views to the west would be partially obstructed by the bridge structure in the foreground. This alternative would not restrict access to the remaining park land.

Replacement Alternative S-4 would result in a Section 4(f) use of the proposed park.

6.4.4 Summary of Project Uses of Section 4(f) Resources, by Alternative

Every build alternative would result in a Section 4(f) use, though the build alternatives would not all result in the use of the same Section 4(f) resources. The matrix below summarizes the Section 4(f) resources that would be used by the project build alternatives. The No-Build Alternative would not use any Section 4(f) resources; it is not included in the matrix. Examining the Section 4(f) uses in combination demonstrates the extent of Section 4(f) uses for each build alternative.

	Retrofit Existing Structure	**Replacement Alternative N-2**	**Replacement Alternative N-6**	**Replacement Alternative S-4**
Existing SFOBB East Span	**P**	**P**	**P**	**P**
Senior Officers' Quarters Historic District	**P**	**T**	**T**	**T**
Proposed Gateway Park	**-**	**-**	**-**	**P**

P = Permanent Section 4(f) use;
T = Temporary occupancy resulting in a Section 4(f) use;
- = No Section 4(f) use.

All of the build alternatives would result in a permanent Section 4(f) use of the historic bridge, as a result of substantial alteration or removal of the East Span. The Retrofit Existing Structure Alternative would permanently incorporate about 9.3 square meters (100 square feet) of the grounds of the Senior Officers' Quarters Historic District, as a result of enlarging a column footing at the historic district boundary. The temporary detours for all of the replacement alternatives would temporarily use the Senior Officers' Quarters Historic District, as a result of placing about four to six temporary detour columns within the grounds of the historic district for up to 45 months during construction of the replacement bridge structure. Replacement Alternative S-4 would result in the Section 4(f) use of the proposed Gateway Park by permanently incorporating about 3 hectares (7.4 acres) of the proposed park into the bridge facility at the Oakland Touchdown.

6.5 AVOIDANCE ALTERNATIVES

Every build alternative results in a Section 4(f) use. Potential alternatives that avoid all Section 4(f) uses are addressed below, followed by a discussion of possible ways to avoid uses of individual Section 4(f) resources.

6.5.1 Build Alternatives that Avoid All Section 4(f) Uses

This section considers the potential for build alternatives that would avoid a Section 4(f) use of the existing East Span of the SFOBB and all other Section 4(f) resources.

Any build alternative that avoids all Section 4(f) uses would require construction of a new bridge, since a retrofit cannot be accomplished without causing a Section 4(f) use. All build alternatives would have one of two possible outcomes: either the existing East Span would be retained for transportation purposes or the existing East Span would no longer be used for transportation purposes.

If the existing East Span were retained for transportation purposes, it would still require extensive seismic retrofit to survive an MCE, in accordance with the project's purpose and need. The Interim Retrofit of the existing East Span adds some earthquake protection, but it will not enable the existing East Span to survive an MCE. Extensive seismic retrofit would result in modifications to the existing East Span of comparable magnitude to what is already proposed by the Retrofit Existing Structure Alternative. Extensive modification of the existing East Span would not avoid a Section 4(f) use of the East Span.

If the existing East Span were no longer used for transportation purposes and Caltrans were to propose leaving it in place, this would not meet USCG requirements. USCG has stated that, pursuant to the USCG Bridge Administration Manual, it would require that the existing East Span be removed if a new bridge were constructed (see correspondence from USCG, August 12, 1998, in Appendix G). Removal of the existing East Span pursuant to USCG's requirement would result in a Section 4(f) use of the historic resource.

All potential build alternatives would result in the need to either extensively retrofit or remove the existing East Span. Either of these actions would result in a Section 4(f) use of the historic bridge. Therefore, there is no build alternative that avoids all Section 4(f) uses.

6.5.2 Alternatives that Avoid Individual Section 4(f) Uses

There is no build alternative that avoids use of all Section 4(f) resources. The discussion below evaluates potential avoidance alternatives to avoid Section 4(f) use of individual Section 4(f) resources.

East Span of the SFOBB

Rehabilitate the Existing East Span without Affecting Its Historic Integrity. As discussed previously, the existing East Span is vulnerable to earthquake forces generated by an MCE. A retrofit strategy that would rehabilitate the East Span to withstand an MCE would require substantial alterations to the existing bridge elements. These alterations, as discussed above under the Retrofit Existing Structure Alternative, would result in a Section 4(f) use. There is no way to avoid a Section 4(f) use of the SFOBB and still rehabilitate the East Span in a manner that would enable it to withstand substantial earthquake forces. This does not constitute a feasible and prudent avoidance alternative.

Senior Officers' Quarters Historic District

Avoid Use by Retrofit Existing Structure Alternative. If bridge Column YB2 were enlarged on three sides only and not enlarged on the side nearest the historic district, this would possibly avoid a Section 4(f) use of the historic district and, as such, would constitute an avoidance of the use of the historic district. However, this is not an ideal engineering solution. It would require more piles or tie-downs underground to balance the load carried on the column foundation. It would be an "unbalanced" engineering design. Unbalanced engineering designs do not perform as well as balanced designs in a seismic event. Furthermore, tie-downs are not desirable structural elements for permanent structures, because not much is known about their long-term performance and because any below-ground failures over time would be difficult to identify, inspect, or repair. This design is not a feasible and prudent alternative to avoid use of the Senior Officers' Quarters Historic District by the Retrofit Existing Structure Alternative.

Avoid Use by Replacement Alternative Temporary Detours. Use of the historic district by the temporary detours for the replacement alternatives could be avoided by alternatives that would not make use of temporary detours to the north of the existing bridge. These alternatives include building temporary detours only to the south of the existing bridge or closing the bridge for the period it takes to construct the transition on YBI.

1. Building temporary detours to the south (the south-only temporary detour) was one of the temporary detours previously considered but no longer under consideration. The south-only temporary detour would be a double-deck structure located south of the existing transition structure. Westbound traffic would travel on the upper deck

of the existing bridge to the upper deck of the temporary detour, then to the YBI Tunnel. Eastbound traffic would exit the tunnel onto the lower deck of the temporary detour, then onto the lower deck of the existing bridge. Construction of this temporary detour would require that an 88-meter (288-foot) section of the existing bridge be cut away, removed, and replaced with a temporary detour. The replacement section would be lifted in place. It has been estimated that this operation would require complete closure of the East Span for two to four weeks, with diversion of 272,000 vehicles per day to other routes and/or transportation modes. Based on the complexity of construction and the requirement for complete closure of the East Span for over a week, the south-only temporary detour is not a feasible and prudent avoidance alternative, as it results in impacts of extraordinary magnitude.

2. The existing East Span could be closed for the period necessary to connect new structures to the existing tunnel and tunnel approach. This would eliminate the need for temporary detours, thereby avoiding a Section 4(f) use by temporary detours. The East Span would be closed for approximately 15 months in order to complete the necessary construction work. This would require diverting 272,000 vehicles per day to other routes and/or other transportation modes. The West Span would remain open to provide vehicle access to YBI and Treasure Island from San Francisco. Closing the bridge for such a length of time would result in substantial changes to regional transportation, along with economic impacts and political opposition. This construction alternative results in impacts of extraordinary magnitude, and it is not a prudent avoidance alternative.

Gateway Park

Replacement Alternative S-4 results in a Section 4(f) use of the proposed Gateway Park. The No-Build Alternative, Retrofit Existing Structure Alternative, and Replacement Alternatives N-2 and N-6 would not. The use of the proposed Gateway Park by Replacement Alternative S-4 could be avoided by selecting the No-Build Alternative, the Retrofit Existing Structure Alternative, or Replacement Alternatives N-2 or N-6. A realignment of Replacement Alternative S-4 that would reduce the use of the proposed Gateway Park and achieve a similar tie-in point with existing travel lanes would conflict with the in-Bay portion of the EBMUD outfall. See Section 2.7.5 — Replacement Alternative S-1, Further Study of Relocating or Straddling the Outfall for a discussion of risks associated with the EBMUD outfall.

6.6 MEASURES TO MINIMIZE HARM

6.6.1 Historic Resources

Memorandum of Agreement

Mitigation measures were developed through consultation with the SHPO, the ACHP, the USCG, the FHWA, and Caltrans, and with input from the Navy, CCSF, City of Oakland, historic preservation organizations, and Native Americans. These mitigation measures were incorporated into an MOA for this undertaking. The MOA was signed by FHWA, SHPO, ACHP and the USCG. Caltrans and various Native American individuals and groups are concurring parties. The executed MOA stipulates the

commitments that Caltrans and FHWA have made to mitigate the project's potential effects on historic properties. This MOA is alternative-neutral; that is, it outlines commitments that would be made for each project alternative. The commitments that apply to the alternative to be selected in the Record of Decision will be the ones that will be implemented. A copy of the executed MOA is in Appendix O of this Final Environmental Impact Statement.

East Span of the SFOBB

Preferred Alternative. The Preferred Alternative, Replacement Alternative N-6, would remove the existing East Span of the SFOBB, resulting in a Section 4(f) use of this resource. Measures to minimize harm as a result of this Section 4(f) use include (see Stipulation III, A through F, in Appendix O):

- Caltrans would offer selected components of the existing bridge to the owners of the proposed Gateway Park;
- Caltrans would develop and install permanent interpretive exhibits at the Gateway Park or an alternative East Bay location, and on YBI, pending agreements with property owners;
- Caltrans would consult with various Bay Area museums regarding development of a museum exhibit about the major bridges of the Bay. If agreement is reached with a museum, Caltrans would identify and conserve documentary materials and would contribute toward the cost of preparing and presenting the exhibit;
- Caltrans would offer the museum exhibit materials to other entities for permanent curation and public display;
- Caltrans would produce oral history documentation related to the construction and operation of the Bay Bridge; and
- Caltrans would make existing documentary videos about the bridge available to specific repositories, and will develop curriculum for use in schools.

As a related activity, Historic American Engineering Record (HAER) documentation for the entire SFOBB has been completed. It provides extensive graphic, photographic, and text recordation of the entire bridge, including the East Span. HAER recordation has been carried out as mitigation for the other seismic retrofit projects on the entire bridge from Fifth Street in San Francisco to the Oakland Touchdown.

Other Alternatives. The Retrofit Existing Structure Alternative would alter rather than remove the existing East Span. As a result, not all measures to minimize harm that are appropriate for the Preferred Alternative would apply to the Retrofit Existing Structure Alternative. Measures to minimize harm as a result of the Retrofit Existing Structure Alternative include (see Stipulations E and F, Appendix O):

- Caltrans would produce oral history documentation related to the construction and operation of the Bay Bridge; and

- Caltrans would make existing documentary videos about the bridge available to specific repositories and will develop curriculum for use in schools.

The same measures to minimize harm that apply to the Preferred Alternative, Replacement Alternative N-6, also apply to Replacement Alternatives N-2 and S-4.

Measures to Minimize Harm to the SFOBB Considered and Withdrawn

Rehabilitate the Cantilever Truss and Replace the Remaining Portions. As another project alternative, in order to minimize harm, it has been suggested that rehabilitating the cantilever truss of the East Span and constructing an improved viaduct leading up to it would be preservation-sensitive. The cantilever section was suggested for preservation efforts because particular engineering significance is attributed to this section of the East Span.

Retrofit of the cantilever truss would involve extensive work. This work was briefly cited in the description of the Retrofit Existing Structure Alternative above. More specifically, calculations have indicated that major structural members of the cantilever truss would need to be replaced if they are not structurally isolated in terms of their response to earthquake forces. In order to avoid the tremendous traffic disruption and cost associated with major replacement tasks, external strengthening would be proposed to retrofit this section. This strengthening would be accomplished by constructing additional trusses to surround, stiffen, and confine the existing cantilever truss system. The existing tower legs would require substantial widening or the addition of supplemental tower legs to support the weight of this massive new truss. The column foundations would need substantial retrofitting to withstand the additional loads. Retrofit of the cantilever truss to withstand an MCE would result in substantial changes to that section of the East Span. This alternative does minimize harm to the bridge when compared to complete dismantling. However, the cantilever would not be retrofitted to lifeline criteria, and this measure to minimize harm would not meet the project purpose and need; further, it would still substantially impair the historic engineering characteristics of the structure.

Market the Bridge in Order to Preserve It in a New Location. Marketing the bridge itself has been suggested as a measure to minimize harm. Marketing of a bridge is often pursued when a historic bridge is replaced. This is not expected to be an effective preservation measure for the East Span of the SFOBB. Because of the sheer size of the bridge span (double deck, 3.9 kilometers [2.4 miles] long) and the multiple components that comprise it (cantilever truss and multiple other trusses of varying lengths), the East Span would be extremely difficult to transfer in its entirety to a single responsible party. It is only slightly more possible that the bridge could be broken into separate trusses for relocation to multiple locations with multiple owners. It is unlikely that a party could be found who would accept the bridge either in its entirety or in segments with preservation covenants and who would be willing to have the bridge or components open to the public. If moved to a seismically active region, it would still require retrofit, at great cost. Moving costs are also likely to be prohibitive.

Senior Officers' Quarters Historic District

Preferred Alternative. The Preferred Alternative, Replacement Alternative N-6, would not result in a permanent Section 4(f) use of the Senior Officers' Quarters Historic District. It would place temporary columns and temporary support structures within and above open and landscaped areas of the historic district. FHWA determined that this activity results in a Section 4(f) use. Measures to minimize harm include (see Stipulations V and VI, Appendix O):

- Caltrans would develop and implement protective measures;
- Caltrans would repair any damage caused by the project in accordance with the Secretary of the Interior's Standards for Rehabilitation; and
- Caltrans would restore the grounds, including but not limited to placement of new sod in grass areas, replacement of shrubbery and trees, regrading and revegetation of disturbed slopes, and repair or replacement of damaged paving, sidewalks, and curbs.

Other Alternatives. Enlarging Column YB2 as part of the Retrofit Existing Structure Alternative would incorporate approximately 9.3 square meters (100 square feet) from the historic district. Columns YB2 and YB3 would be encased in concrete, obstructing views from the Senior Officers' Quarters. As a measure to minimize harm, screen planting would be provided to screen views of YB2 and YB3 from the Senior Officers' Quarters.

The measures to minimize harm to the Senior Officers' Quarters Historic District as a result of the Preferred Alternative would be the same for Replacement Alternatives N-2 and S-4.

6.6.2 Gateway Park

Preferred Alternative. Replacement Alternative N-6 would not result in a Section 4(f) use of the proposed Gateway Park, so no measures to minimize harm are proposed.

Other Alternatives. Replacement Alternative N-2 and the Retrofit Existing Structure Alternative would not result in a Section 4(f) use of the proposed Gateway Park, so no measures to minimize harm are proposed for these alternatives.

Measures to minimize harm to the proposed Gateway Park as a result of Replacement Alternative S-4 include replacing the land required for Replacement Alternative S-4 so that there would be no-net-loss of public shoreline access. This could be accomplished by acquiring land nearby to contribute toward another smaller park in the general area. Alternatively, the City of Oakland has suggested that Bay fill be added to the south of the existing shoreline to extend the park southward and retain the same acreage. BCDC staff has indicated that the outline of the Oakland Touchdown could be modified as part of the park development. Toward this end, BCDC staff has

indicated that a permit for new Bay fill may be granted if an equal or greater amount of existing Bay fill were removed from other parts of the Oakland Touchdown.

6.7 OTHER PARK, RECREATIONAL FACILITIES, WILDLIFE REFUGES, AND HISTORIC PROPERTIES EVALUATED RELATIVE TO THE REQUIREMENTS OF SECTION 4(f)

6.7.1 Introduction

The purpose of this discussion is to address Section 4(f) requirements relative to other publicly owned parks, recreational facilities, and wildlife refuges, and other historic properties in the project vicinity. There are no wildlife refuges in the vicinity. The following resources discussed below were identified in the project vicinity:

Other Existing or Proposed Park and Recreational Facilities Evaluated

- Radio Beach
- Proposed public access to the Bay at the Oakland Touchdown
- Proposed transbay segment of the Bay Trail

Other Historic Sites Evaluated

- Quarters 1
- Quarters 8
- Quarters 9
- Quarters 10
- Building 262
- Key Pier Substation (contributor to the SFOBB and individually eligible)
- Prehistoric component of Archaeological Site CA-SFr-04/H
- Potential historic archaeological deposits on YBI

The discussion of each resource either documents:

- Why the resource is not protected by the provisions of Section 4(f) or
- If it is protected by Section 4(f), why none of the alternatives under consideration causes a Section 4(f) use by:
  - permanently incorporating land into the project,
  - temporary occupancy of land that is adverse to the preservationist purposes of Section 4(f), or
  - constructive use of land from the resource.

6.7.2 Other Public Park and Recreational Facilities Within the Project Area

Near the project, three other existing or proposed park or recreational facilities were evaluated. These are Radio Beach, a proposed transbay segment of the San Francisco Bay Trail, and the proposed public access at the Oakland Touchdown as conditions on the BCDC's permit for the I-880/Cypress Freeway Replacement Project.

Radio Beach

Radio Beach is on the north side of the Oakland Touchdown, about midway between the western end and the Emeryville Crescent (see Figure 6-21 in Appendix A). It is near a radio station and radio transmission tower from which it derives its name. Radio Beach is owned by the Port. Some land in the area of Radio Beach is leased by the Port to a private leaseholder; this includes a portion of the beach itself, as well as the radio station building and the transmission tower adjacent to it (see Figure 6-21 in Appendix A).

Radio Beach has no defined boundary, no property description, and is not parceled. It has not been developed as a park, and it is not identified as a specific facility in any agency's inventory of parks. It is not considered a recreation area by the Port and, due to its small size, proximity to bridge traffic, and poor access, the Port does not consider the site to be significant for recreational purposes. Radio Beach is not protected by Section 4(f).

In spring of 2000, it appeared that EBRPD would enter into a long-term lease with the Port, to lease portions of Radio Beach not already leased to others. Caltrans initiated a meeting on March 3, 2000, with the Port, EBRPD, and FHWA to discuss land-use planning in the area. As a result of the meeting, FHWA determined that EBRPD's pending lease of Radio Beach for park purposes would make the Radio Beach area a Section 4(f) resource; FHWA further determined that a Section 4(f) use of this resource could be avoided through joint planning. Subsequently, other changes in proposed land use planning have occurred at the Oakland Touchdown. The BCDC found that OBRA's proposals for certain inland portions of the former OARB would not accommodate the Port's future needs and would not be consistent with the Seaport Plan and the San Francisco Bay Plan. As a result, OBRA has altered the proposed land uses for these portions of the base. OBRA has agreed with the Port to trade various Army Base parcels to arrive at a better overall reuse plan. In January 2001, BCDC's commission approved an application to revise the Bay Plan and the Seaport Plan based on these new reuse proposals. However, the designation of land for a future park at the western end of the base is not being revisited; OBRA remains committed to this land use proposal. As OBRA is reconsidering base reuse proposals, the Port is also reconsidering decisions regarding its property, including Radio Beach. The long-term lease of Radio Beach by EBRPD has been deferred and remains in question. EBRPD and the Port have elected to await the outcome of other land use decisions before they reaffirm an interest in entering into a lease agreement regarding Radio Beach. EBRPD's potential leasehold of Radio Beach is therefore more tenuous than it appeared to be in spring of 2000. The Port will retain ownership without leasing Radio Beach. FHWA has therefore determined that Radio Beach is not a Section 4(f) protected resource on the basis of consultation with the Port as the officials having jurisdiction (see correspondence from Port, April 1, 1999, in Appendix G).

Proposed Transbay Segment of the Bay Trail

In 1989, the Association of Bay Area Governments (ABAG) prepared the Bay Trail Plan. This plan established policies and proposed alignments for a bicycle and pedestrian trail system around the perimeter of San Francisco and San Pablo Bays. It provides a recommended route for a continuous trail and policies to guide the selection of

alignments and trail design and implementation. ABAG provides planning input but does not fund Bay Trail segments. Individual projects to implement segments of the Bay Trail are funded by other agencies and organizations. Such projects are subject to independent environmental review as well as applicable permitting from BCDC or other agencies that may have jurisdiction. The Bay Trail Plan designated many existing trails as segments of the Bay Trail, and it proposed new trail segments that would make the Bay Trail continuous. It did not specify the exact locations, features, and connections of future trail segments. Existing segments of the Bay Trail, as recreational trails on publicly owned land or easements, are Section 4(f) resources.

ABAG's Bay Trail Plan proposed that segments of the Bay Trail cross San Francisco Bay via all transbay bridges, including the SFOBB. There is currently no Bay Trail crossing of the Bay via the SFOBB. East Span Project replacement alternatives each include a bicycle/pedestrian path. ABAG supports construction of such a path as part of this project. The transbay route of the bicycle path is currently designated as "Bay Trail, proposed" by ABAG (see Figure 6-20 in Appendix A).

On June 24, 1998, the MTC voted to fund a bicycle/pedestrian path as part of a replacement structure. Therefore, the locally preferred design, as expressed by MTC, would include a bicycle/pedestrian path. The No-Build and Retrofit Existing Structure Alternatives would not include a bicycle/pedestrian path; the replacement alternatives would include a bicycle/pedestrian path. If constructed, the path may ultimately be designated as part of the Bay Trail; such a designation would extend the Bay Trail from the east shore to YBI. Caltrans is conducting a feasibility study for placing a bicycle/pedestrian path on the West Span of the SFOBB, including how to connect a path on the East Span to a potential path on the West Span. This study is still under way.

This segment of the Bay Trail does not currently exist. It is not expected to be implemented by any agency as a separate project. Although funding has been identified for a facility on the East Span that would become part of the Bay Trail, it would only be constructed as part of a replacement alternative for the East Span Project. The No-Build and Retrofit Existing Structure Alternatives would not implement this segment of the Bay Trail, and any of the replacement alternatives would implement it. The proposed Bay Trail is not protected by Section 4(f).

Proposed Public Access to the Bay at the Oakland Touchdown

As part of the I-880/Cypress Freeway Replacement Project (on I-880 in Oakland, Alameda County), Caltrans obtained a permit from the Bay Conservation and Development Commission (BCDC). The permit (number 11-93, as amended) included conditions to provide public access improvements to San Francisco Bay at the Oakland Touchdown. These include a bicycle path out to the western end of the Oakland Touchdown, where viewing areas would be provided, along with benches and limited parking. These public access improvements are described in concept in the permit granted by BCDC for the I-880/Cypress Freeway Replacement Project. The permit stipulates that these public access improvements are conditioned on the feasibility of construction; should construction prove infeasible, the permit provides that financial compensation would be accepted in lieu of constructing these improvements.

The public access improvements are conditions on the BCDC permit for a previous project. The permit conditions were developed prior to OBRA's designation of part of the former OARB as a future park. Pursuant to the amended BCDC permit, the final location of the public access improvements will be coordinated with the location of the East Span Project. The public access improvements will be implemented in compliance with BCDC permit conditions regardless of which alternative is selected for the East Span Seismic Safety Project. They will undergo separate environmental review, and they will be subject to review and approval by BCDC in order to demonstrate fulfillment of the permit conditions. Some of these public access improvements, such as the bicycle path, may be within the boundary of the proposed Gateway Park. Any such public access improvements will be jointly planned with EBRPD.

The public access improvements have not yet been constructed or developed beyond the original concept. The bicycle path out to the Oakland Touchdown is consistent with the San Francisco Bay Trail (discussed in greater detail above). Once implemented, the bicycle path would become part of the San Francisco Bay Trail. The route of the bicycle path out to the Oakland Touchdown is currently designated as "Bay Trail, proposed" by ABAG (see Figure 6-20 in Appendix A).

When replacement of the East Span became one of the retrofit strategies being considered for the East Span Project, concepts had not yet been developed for these public access improvements and both Caltrans and BCDC recognized the need for coordination between the two undertakings. Both agencies acknowledge the need for joint planning of the public access improvements and the East Span Project. In 1998, BCDC amended the permit for the I-880/Cypress Freeway Replacement Project to establish a schedule that would provide a joint planning process for these two projects and allow the public access improvements to be implemented after the East Span Project. The amended permit stipulates that "[t]he planning and final location and design of all public access areas and improvements required by this amended permit shall be coordinated with the location and design of the Bay Bridge Seismic Retrofit Project."

Pursuant to the amended permit, the final location and design of these public access improvements is subject to coordination with the East Span Project, and financial compensation may be made in place of any public access improvements for which construction proves to be infeasible. The East Span Project and the public access improvements are being jointly planned to be compatible with each other, so that there will not be a Section 4(f) use.

6.7.3 Other Historic Sites Evaluated

In addition to the bridge and its contributing elements and the Senior Officers' Quarters Historic District, there are six historic properties within the Area of Potential Effect as defined by the implementing regulations of the National Historic Preservation Act of 1966.

On YBI, the historic properties include Quarters 1, Quarters 8, Quarters 9, Quarters 10, and Building 262 (see Figures 6-4, 6-5, and 6-6 in Appendix A). All of these historic properties are eligible for the NRHP under Criteria A and/or C. Criterion A applies to historic properties associated with events that have made a significant contribution to the broad patterns of our history. Criterion C applies to historic properties that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

At the Oakland Touchdown, the historic property is the Key Pier Substation (see Figures 6-7 and 6-8 in Appendix A). This property is individually eligible for NRHP listing under Criterion A at the local level of significance, as a rare surviving component of the historically significant Key System railway.

There is also one prehistoric archaeological site on YBI within the Area of Potential Effect, and there is the potential for historic archaeological resources. All of these resources are discussed below.

Quarters 1

Quarters 1 is listed as an individual property on the NRHP under Criteria A and C, for its association with military history and its architecture. It is also a contributor to the Senior Officers' Quarters Historic District, which is eligible for the NRHP under Criteria A and C, for the historic district's association with military history and the architecture of its contributing buildings. Quarters 1 is of wood frame construction, with two full floors and dormered attic stories. It was constructed in 1899-1900 in the Classical Revival style. The largest and most elaborate of the buildings in the historic district, Quarters 1 was individually listed on the NRHP in 1991. Section 6.4.2 of this final Section 4(f) evaluation, which discusses the Senior Officers' Quarters Historic District, also contains discussion of Quarters 1 in its context as a contributor to the District.

The property associated with Quarters 1 is bounded by the drive in front of the house (Whiting Way), the near edge of the lawn area below Quarters 1, brick retaining walls at the edge of the paved area behind the house, and the driveway between Quarters 1 and Quarters 2.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would not incorporate any land from Quarters 1 into the transportation facility, nor would it temporarily occupy any land from Quarters 1.

The potential for constructive use was also evaluated. Quarters 1 was listed on the NRHP with the existing bridge in place; the existing noise from the bridge did not affect its listing. The attributes that qualify Quarters 1 for the NRHP are its architecture and its association with military history. There are no noise-sensitive activities associated with these attributes.

The primary views of Quarters 1 are from the flat, paved area below it, referred to as the Parade Grounds. The Retrofit Existing Structure Alternative would modify the

existing bridge, which is to the left of a viewer on the Parade Grounds; this alternative would not obstruct the primary views. Based on the 1991 National Register Registration Form prepared by the Navy for Quarters 1, with which SHPO concurred, this historic resource does not derive its value in substantial part from its setting. Vegetation removal outside the historic district as a result of construction would alter the appearance of the setting; however, it would not substantially impair the attributes that qualify this resource for the NRHP.

The Retrofit Existing Structure Alternative would not result in any permanent change in access to Quarters 1. During construction, some delays and/or closures would occur on the East Span itself, and some temporary detours and/or traffic controls would occur on YBI, which could temporarily delay persons heading toward Quarters 1 or cause them to use an alternate route. However, access to Quarters 1 itself would be maintained.

Vibration levels from impact-related construction activities, such as pile driving, have the potential to cause building damage. There are no federal or state standards for vibration levels. However, Caltrans has measured the vibrations generated during various construction activities. Pile driving has frequently been done at distances of about 7.5 to 15 meters (25 to 50 feet) from buildings without causing damage. Generally speaking, a building that is more than 15 to 30 meters (50 to 100 feet) from pile driving would not be damaged.[1] The Retrofit Existing Structure Alternative would drive piles about 55 meters (180 feet) from Quarters 1. (It should be noted that humans perceive vibration levels that are well below the architectural damage risk level; human perception of vibration is therefore not a measure of the potential for architectural damage.) Construction-period impacts would also be documented and monitored (see Stipulation V of the MOA in Appendix O of this FEIS). As a result, vibration levels from construction of the Retrofit Existing Structure Alternative would not substantially impair Quarters 1. Vibration from construction of the Retrofit Existing Structure Alternative would not result in proximity impacts.

The attributes that qualify Quarters 1 for the NRHP, its association with military history and its architecture, would not be substantially impaired by proximity impacts of the Retrofit Existing Structure Alternative.

The Retrofit Existing Structure Alternative would not result in a Section 4(f) use of Quarters 1.

Replacement Alternatives. None of the replacement alternatives would incorporate any land from Quarters 1 into the transportation facility, nor would it temporarily occupy any land from Quarters 1.

The potential for constructive use was also evaluated. As noted above, the NRHP listing of Quarters 1 is not based on any noise-sensitive attributes. There are no noise-sensitive activities associated with the attributes that qualify Quarters 1 for the NRHP, its architecture and its association with military history.

[1] Transportation Related Earthborne Vibrations, *Caltrans Experiences*, Caltrans, 1992.)

The primary views of Quarters 1 are from the flat, paved area below it, called the Parade Grounds. Although the alignments of Replacement Alternatives N-2 and N-6 would be closer to the historic district than the existing bridge, they would still be to the left of Quarters 1 from the perspective of a viewer on the Parade Grounds; they would not obstruct these views. The alignment of Replacement Alternative S-4 would be farther from the historic district than the existing bridge; it would not obstruct the primary views.

As noted above, this historic resource does not derive its value in substantial part from its setting. During construction, vegetation would be removed outside the Senior Officers' Quarters Historic District, which includes Quarters 1; this would alter the appearance of the setting. However, it would not substantially impair the attributes that qualify this resource for the NRHP, its architecture and its association with military history.

The replacement alternatives would not result in any permanent change in access to Quarters 1. As with the Retrofit Existing Structure Alternative, construction activities for any of the replacement alternatives could temporarily delay or reroute persons heading toward Quarters 1. However, access to Quarters 1 would be maintained.

Under the replacement alternatives, the closest pile driving would be about 90 meters (295 feet) from Quarters 1, and the closest foundation dismantling would be about 55 meters (180 feet) away. Construction-related vibration levels at Quarters 1 are therefore expected to be below the architectural damage risk level. Construction-period impacts would also be documented and monitored (see Stipulation V of the MOA in Appendix O of this FEIS). As a result, vibration levels from construction of the replacement alternatives would not substantially impair Quarters 1. Vibration from construction of the replacement alternatives would not result in proximity impacts to this Section 4(f) resource.

The attributes that qualify Quarters 1 for the NRHP, its association with military history and its architecture, would not be substantially impaired by proximity impacts of the replacement alternatives.

The replacement alternatives would not result in a Section 4(f) use of Quarters 1.

Quarters 8

Quarters 8 is a three-story residence of Mediterranean design, built of wood with a stucco exterior on the first two floors (see Figures 6-4, 6-5, and 6-6 in Appendix A.) It was constructed in 1905 as the home of the commander of the Marine Corps detachment assigned to YBI. The property is eligible for the NRHP at the local level of significance under Criteria A and C, in the areas of military history and architecture. The house is historically significant as one of the few extant buildings from the early 20th century associated with the Naval Station on YBI and the last remaining building associated with the Marine Corps presence on the island. It is also architecturally significant as the work of the prominent San Francisco architects James and Merritt Reid.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would not incorporate any land from Quarters 8 into the transportation facility, nor would it temporarily occupy any land from Quarters 8.

The potential for constructive use was also evaluated. Quarters 8 was determined to be eligible for the NRHP with the existing bridge in place; the existing noise from the bridge did not affect its eligibility. Its eligibility is not based on any noise-sensitive attributes. The attributes that qualify Quarters 8 for the NRHP are in the areas of military history and architecture. There are no noise-sensitive activities associated with these attributes.

The primary views of Quarters 8 are from the roadway approaching and in front of it; the Retrofit Existing Structure Alternative would not obstruct the primary views. Based on the 1997 Primary Record Form prepared by Caltrans for Quarters 8, with which SHPO concurred, this historic resource does not derive its value in substantial part from its setting. Vegetation removal nearby as a result of construction would alter the appearance of the setting; however, it would not substantially impair the attributes that qualify this resource for the NRHP.

The Retrofit Existing Structure Alternative would not result in any permanent change in access to Quarters 8, though construction activities could delay or reroute persons heading toward Quarters 8. However, access to Quarters 8 would be maintained.

Under the Retrofit Existing Structure Alternative, the closest foundation work would be about 70 meters (230 feet) from Quarters 8. Construction-related vibration levels at Quarters 8 are therefore expected to be below the architectural damage risk level. Construction-period impacts would also be documented and monitored (see Stipulation V of the MOA in Appendix O of this FEIS). As a result, vibration levels from construction of the Retrofit Existing Structure Alternative would not substantially impair Quarters 8. Vibration from construction of the Retrofit Existing Structure Alternative would not result in proximity impacts to this Section 4(f) resource.

The attributes that qualify Quarters 8 for the NRHP, its association with military history and its architecture, would not be substantially impaired by proximity impacts of the Retrofit Existing Structure Alternative.

The Retrofit Existing Structure Alternative would not result in a Section 4(f) use of Quarters 8.

Replacement Alternatives. None of the replacement alternatives would incorporate any land from Quarters 8 into the transportation facility, nor would they temporarily occupy any land from Quarters 8.

The potential for constructive use was also evaluated. The replacement alternatives would reduce noise levels at Quarters 8. The replacement alternatives would not obstruct the primary view of Quarters 8, which is from the roadway approaching and in front of the building. Removal of vegetation near Quarters 8 during construction would

alter the appearance of the setting of this historic building. This change in the setting as a result of replacement alternatives would not alter the historic building's association with military history or its architecture, the attributes that qualify it for the NRHP. The replacement alternatives would not result in any permanent change in access to Quarters 8.

Under the replacement alternatives, the closest pile driving would be about 80 meters (260 feet) from Quarters 8, and the closest foundation dismantling would be about 70 meters (230 feet) away. Pavement work to alter the roadways near Quarters 8 is typical local street roadwork, and it would not generate architecturally damaging vibration levels. Construction-related vibration levels at Quarters 8 are therefore expected to be below the architectural damage risk level. Construction-period impacts would also be documented and monitored (see Stipulation V of the MOA in Appendix O of this FEIS). As a result, vibration levels from construction of the replacement alternatives would not substantially impair Quarters 8. Vibration from construction of the replacement alternatives would not result in proximity impacts to this Section 4(f) resource.

The attributes that qualify Quarters 8 for the NRHP (its association with military history and its architecture) would not be substantially impaired by proximity impacts of the replacement alternatives.

The replacement alternatives would not result in a Section 4(f) use of Quarters 8.

Quarters 9

Quarters 9 is a 1-1/2-story residence of wood-frame construction. (See Figures 6-4, 6-5, and 6-6 in Appendix A.) The property is eligible for the NRHP at the local level of significance under Criteria A and C, in the areas of military history and architecture. It was built ca. 1916 as the residence for the civilian "master of tugs" and is the only extant building on YBI constructed for a civilian employee of the Navy. It is also one of the few surviving buildings on the island from the period of extensive growth of the Naval Station in the years before and during U.S. involvement in World War I.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would not incorporate any land from Quarters 9 into the transportation facility, nor would it temporarily occupy any land from Quarters 9.

The potential for constructive use was also evaluated. Noise from the existing bridge did not affect the eligibility of Quarters 9 for the NRHP.. The attributes that qualify Quarters 9 for the NRHP are in the areas of military history and architecture, which are not noise-sensitive attributes. There are no noise-sensitive activities associated with these attributes.

The primary views of Quarters 9 are from the approach to the building. Trees currently screen views of Quarters 9 from most directions; these trees would not be removed by the Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would not obstruct the primary views.

The Retrofit Existing Structure Alternative would not result in any permanent change in access to Quarters 9, though construction activities could delay or reroute persons heading toward it. Access to Quarters 9 would be maintained during construction.

Under the Retrofit Existing Structure Alternative, the closest foundation work would be about 140 meters (455 feet) from Quarters 9. Construction-related vibration levels at Quarters 9 are therefore expected to be below the architectural damage risk level. Construction-period impacts would also be documented and monitored (see Stipulation V of the MOA in Appendix O of this FEIS). As a result, vibration levels from construction of the Retrofit Existing Structure Alternative would not substantially impair Quarters 9. Vibration from construction of the Retrofit Existing Structure Alternative would not result in proximity impacts to this Section 4(f) resource.

The attributes that qualify Quarters 9 for the NRHP, its association with military history and its architecture, would not be substantially impaired by proximity impacts of the Retrofit Existing Structure Alternative.

The Retrofit Existing Structure Alternative would not result in a Section 4(f) use of Quarters 9.

Replacement Alternatives. None of the replacement alternatives would incorporate any land from Quarters 9 into the transportation facility, nor would they temporarily occupy any land from Quarters 9.

The potential for constructive use was also evaluated. The attributes that qualify Quarters 9 for the NRHP are in the areas of military history and architecture, which are not noise-sensitive attributes. There are no noise-sensitive activities associated with these attributes.

The primary views of Quarters 9 are from the approach to the building. Trees currently screen views from most directions; these trees would not be removed by any of the build alternatives for the East Span Project. The replacement alternatives would not obstruct the primary views.

The replacement alternatives would not result in any permanent change in access to Quarters 9, though construction activities could delay or reroute persons heading toward it. Access to Quarters 9 would be maintained during construction.

Under the replacement alternatives, the closest pile driving would be about 125 meters (410 feet) from Quarters 9, and the closest foundation dismantling would be about 140 meters (460 feet) away. Construction-related vibration levels at Quarters 9 are therefore expected to be below the architectural damage risk level. Construction-period impacts would also be documented and monitored (see Stipulation V of the MOA in Appendix O of this FEIS). As a result, vibration levels from construction of the replacement alternatives would not substantially impair Quarters 9. Vibration from construction of the replacement alternatives would not result in proximity impacts to this Section 4(f) resource.

The attributes that qualify Quarters 9 for the NRHP, its association with military history and its architecture, would not be substantially impaired by proximity impacts of the replacement alternatives.

The replacement alternatives would not result in a Section 4(f) use of Quarters 9.

Quarters 10

Quarters 10 is a two-story wood-frame residence constructed in 1948 (see Figures 6-4, 6-5, and 6-6 in Appendix A). The property is eligible for the NRHP at the local level of significance under Criterion C, for its architecture. It is architecturally significant as a distinctive example of Bay Area modernism. The historic property includes the house and its immediate grounds, including adjacent lawn and garden areas, the garage (Building 267) and driveway, and the retaining wall along the north side of the property. Quarters 10 is next to Macalla Road, which is not historic.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would not incorporate any land from Quarters 10 into the transportation facility, nor would it temporarily occupy any land from Quarters 10.

The potential for constructive use was also evaluated. Noise from the existing bridge did not affect its eligibility. The attribute that qualifies Quarters 10 for the NRHP is its architecture, which is not a noise-sensitive attribute. There are no noise-sensitive activities associated with this attribute.

The primary views of Quarters 10 are from Macalla Road, which bends in a hairpin turn around the property. Nearby trees screen views of Quarters 10 from most other directions. The Retrofit Existing Structure Alternative would not obstruct the primary views. Based on the 1998 Primary Record Form prepared by Caltrans for Quarters 10, with which SHPO concurred, this historic resource does not derive its value in substantial part from its setting. Vegetation removal nearby as a result of construction would alter the appearance of the setting; however, vegetation removal would not substantially impair the attributes that qualify this resource for the NRHP.

The Retrofit Existing Structure Alternative would not result in any permanent change in access to Quarters 10, though construction activities could delay or reroute persons heading toward it.

Under the Retrofit Existing Structure Alternative, the closest foundation work would be about 60 meters (195 feet) from Quarters 10. Construction-related vibration levels at Quarters 10 are therefore expected to be below the architectural damage risk level. Construction-period impacts would also be documented and monitored (see Stipulation V of the MOA in Appendix O of this FEIS). As a result, vibration levels from construction of the Retrofit Existing Structure Alternative would not substantially impair Quarters 10. Vibration from construction of the Retrofit Existing Structure Alternative would not result in proximity impacts to this Section 4(f) resource.

The attribute that qualifies Quarters 10 for the NRHP, its architecture, would not be substantially impaired by proximity impacts of the Retrofit Existing Structure Alternative.

The Retrofit Existing Structure Alternative would not result in a Section 4(f) use of Quarters 10.

Replacement Alternatives. None of the replacement alternatives would incorporate any land from Quarters 10 into the transportation facility, nor would they temporarily occupy any land from Quarters 10.

The potential for constructive use was also evaluated. The attribute that qualifies Quarters 10 for the NRHP is its architecture, which is not a noise-sensitive attribute. There are no noise-sensitive activities associated with this attribute.

The primary views of Quarters 10 are from Macalla Road, which bends in a hairpin turn around the property. Nearby trees screen views of Quarters 10 from most other directions. The replacement alternatives would not obstruct the primary views. A number of trees downslope of Quarters 10 would be removed by the replacement alternatives; this would remove some of the existing screening and may increase the views of Quarters 10. Based on the information in Caltrans' 1998 Primary Record Form for Quarters 10, with which SHPO concurred, this historic property does not derive its value in substantial part from its setting. Although nearby vegetation removal during construction would alter the appearance of the setting, vegetation removal would not substantially impair the architecture of Quarters 10, which is the attribute that qualifies it for the NRHP.

The replacement alternatives would not result in any permanent change in access to Quarters 10. Activities during construction could delay or reroute persons heading toward Quarters 10. During construction, regrading of Macalla Road at the hairpin turn below Quarters 10 would restrict vehicle access to Quarters 10 for about one to three days, though the historic property would remain accessible on foot.

Under the replacement alternatives, the closest pile driving would be about 110 meters (360 feet) from Quarters 10, and the closest foundation dismantling would be about 60 meters (195 feet) away. Pavement breaking to alter the grade of Macalla Road by Quarters 10 is typical local street roadwork, and it would not generate architecturally damaging vibration levels. Construction-related vibration levels at Quarters 10 are therefore expected to be below the architectural damage risk level. Construction-period impacts would also be documented and monitored (see Stipulation V of the MOA in Appendix O of this FEIS). As a result, vibration levels from construction of the replacement alternatives would not substantially impair Quarters 10. Vibration from construction of the replacement alternatives would not result in proximity impacts to this Section 4(f) resource.

The attribute that qualifies Quarters 10 for the NRHP, its architecture, would not be substantially impaired by proximity impacts of the replacement alternatives.

The replacement alternatives would not result in a Section 4(f) use of Quarters 10.

Building 262

Building 262, at the eastern end of YBI, is a reinforced concrete building with a corrugated tin gable roof (see Figures 6-4, 6-5, and 6-6 in Appendix A). The property is eligible for the NRHP at the state level of significance under Criteria A and C, in the areas of military history and architecture. It was constructed for the U.S. Army in 1891 for the manufacture and storage of mines to be used in coastal defense. The building is historically significant as the only extant building associated with the 19th century Army presence on YBI. It is also significant architecturally, as a pioneering example of reinforced concrete construction, a building technique that was still in its infancy in 1891. The boundary of the historic resource, as described in the evaluation form prepared by the Navy, includes only the building itself.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would modify the existing bridge. The existing bridge passes approximately 28 meters (90 feet) to the southeast of Building 262, and is about 53 meters (175 feet) above the ground in this area. The Retrofit Existing Structure Alternative would not incorporate any land from Building 262 into the transportation facility, nor would it temporarily occupy any land from Building 262.

The potential for constructive use was also evaluated. Noise from the existing bridge did not affect the eligibility of Building 262 for the NRHP. The attributes that qualify it for the NRHP are in the areas of military history and architecture, which are not noise-sensitive attributes. There are no noise-sensitive activities associated with these attributes.

The primary views of Building 262 are from the unpaved access road leading to the building and from boats on the Bay near the eastern end of the island. Under the Retrofit Existing Structure Alternative, existing columns would be enlarged and two additional columns would be added in the main navigation opening between Columns E2 and E3. This would not obstruct primary views of Building 262. Based on the 1997 Primary Record Form prepared by the Navy, with which SHPO concurred, Building 262 does not derive its value in substantial part from its setting. The addition and enlargement of bridge columns would alter the appearance of the setting; however, these changes would not substantially impair the attributes that qualify this resource for the NRHP.

The Retrofit Existing Structure Alternative would not result in any permanent change in access to Building 262, though construction activities could delay or reroute persons heading toward it.

Under the Retrofit Existing Structure Alternative, the closest foundation work would be about 45 meters (150 feet) from Building 262. Construction-related vibration levels at Building 262 are therefore expected to be below the architectural damage risk level. Construction-period impacts would also be documented and monitored (see Stipulation V of the MOA in Appendix O of this FEIS). As a result, vibration levels from construction of the Retrofit Existing Structure Alternative would not substantially impair

Building 262. Vibration from construction of the Retrofit Structure Alternative would not result in proximity impacts to this Section 4(f) resource.

The attributes that qualify Building 262 for the NRHP, its association with military history and its architecture, would not be substantially impaired by proximity impacts of the Retrofit Existing Structure Alternative.

The Retrofit Existing Structure Alternative would not result in a Section 4(f) use of Building 262.

Replacement Alternatives. Under Replacement Alternatives N-2 and N-6, the new bridge would pass directly above Building 262 at approximately the same height as the existing bridge, or about 53 meters (175 feet) above the ground. Replacement Alternative S-4 would pass to the southeast of Building 262 rather than directly above it, and would be farther away from Building 262 than the existing bridge. None of the replacement alternatives would incorporate any land from Building 262 into the transportation facility, nor would they temporarily occupy any land from Building 262.

The potential for constructive use was also evaluated. Noise from the existing bridge did not affect the eligibility of Building 262 for the NRHP. The attributes that qualify it for the NRHP are in the areas of military history and architecture, which are not noise-sensitive attributes. There are no noise-sensitive activities associated with these attributes.

The primary views of Building 262 are from the access road leading to the building and from boats on the Bay near the eastern end of the island. Under Replacement Alternatives N-2 and N-6, a new structure would be built that would span Building 262, and the existing bridge would be dismantled; under Replacement Alternative S-4, a new structure would be built to the south of the existing bridge, and the existing bridge would be dismantled. None of the replacement alternatives obstructs the primary views of Building 262. Building 262 does not derive its value in substantial part from its setting; changing the location of the bridge structure would alter the appearance of the setting, but it would not substantially impair the attributes that qualify this resource for the NRHP.

The replacement alternatives would not result in any permanent change in access to Building 262, though construction activities could delay or reroute persons heading toward it.

Under the replacement alternatives, the closest pile driving would be about 60 meters (195 feet) from Building 262, and the closest foundation dismantling would be about 45 meters (150 feet) away. Construction-related vibration levels at Building 262 are therefore expected to be below the architectural damage risk level. Construction-period impacts would also be documented and monitored (see Stipulation V of the MOA in Appendix O of this FEIS). As a result, vibration levels from construction of the replacement alternatives would not substantially impair Building 262. Vibration from construction of the replacement alternatives would not result in proximity impacts to this Section 4(f) resource.

The attributes that qualify Building 262 for the NRHP, in the areas of military history and architecture, would not be substantially impaired by proximity impacts of the replacement alternatives.

The replacement alternatives would not result in a Section 4(f) use of Building 262.

Summary of Distances from Project Alternatives to Building 262. Below is a table summarizing the horizontal and vertical distances from the bridge to Building 262 (the Torpedo Building) at the closest point for each alternative. The table is provided to assist in understanding the locations of the project alternatives in relation to this historic property. For Replacement Alternatives N-2 and N-6, the horizontal distance is zero; this is because these two alternatives would be constructed to span Building 262 while leaving it in place. Vertical distances are measured from the bridge to the ground directly beneath the bridge at the closest horizontal distance to the building. The building is about 12 meters (40 feet) tall at the top of its gable; Replacement Alternatives N-2 and N-6 would be built about 41 meters (135 feet) above the rooftop of Building 262. Building 262 is not within the area where the temporary detours for the replacement alternatives would be constructed, so horizontal and vertical distances for the temporary detours have been omitted from this table.

Alternative	Approximate Horizontal Distance to Building 262 at the Closest Point	Approximate Vertical Distance to the Closest Point on the Ground Near Building 262
Retrofit Existing Structure Alternative	28 meters (90 feet)	53 meters (175 feet)
Replacement Alternative N-2	0 meter (0 foot)	53 meters (175 feet)
Replacement Alternative N-6	0 meter (0 foot)	53 meters (175 feet)
Replacement Alternative S-4	59 meters (194 feet)	53 meters (175 feet)

Source: Caltrans, November 2000.

While FHWA determined that the project would not result in a Section 4(f) use of Building 262, the building is within the construction zone for the Preferred Alternative, Replacement Alternative N-6, as well as Replacement Alternative N-2. These two replacement alternatives would be constructed over the top of Building 262. In the MOA for the protection of historic properties, Caltrans and FHWA have made commitments to minimize potential harm to Building 262 as a result of all project alternatives, including these two alternatives that would be constructed over the building. The commitments include development and implementation of protective measures, repair of inadvertent damage, and preparation of a historic structure report (see Stipulation IV of the MOA, Appendix O of this FEIS).

Key Pier Substation

The Key Pier Substation is historically significant under Criterion A at the local level. It is a contributor to the SFOBB, and it is also individually eligible as one of the few surviving buildings associated with the Key System (see Figures 6-7 and 6-8 in Appendix A). The boundary of the property includes only the building itself.

Retrofit Existing Structure Alternative. The Retrofit Existing Structure Alternative would not incorporate any land from the Key Pier Substation into the transportation facility, nor would it temporarily occupy any land from the Key Pier Substation.

The potential for constructive use was also evaluated. Noise from the existing bridge did not affect the eligibility of the Key Pier Substation for the NRHP. The attributes that qualify it for the NRHP, being a contributor to the SFOBB as well as a rare surviving building associated with the Key System, are not noise-sensitive attributes. There are no noise-sensitive activities associated with these attributes.

The primary views of the Key Pier Substation are from the roadway in front of it. The Retrofit Existing Structure Alternative would not obstruct its primary views. Based on the 1998 evaluation prepared by Caltrans, with which SHPO concurred, the Key Pier Substation does not derive its value in substantial part from its setting. Although the Retrofit Existing Structure Alternative would alter the appearance of the bridge, thereby changing the setting, this change in the setting would not substantially impair the attributes that qualify the Key Pier Substation for the NRHP.

The Retrofit Existing Structure Alternative would not result in any permanent change in access to this historic building, though access may be restricted during construction. This temporary change in access does not constitute a constructive use; access to the Key Pier Substation is not relevant to its being a contributor to the SFOBB and a surviving building associated with the Key System, which are the attributes that qualify it for the NRHP.

Under the Retrofit Existing Structure Alternative, the closest foundation work would be about 45 meters (150 feet) from the Key Pier Substation. Construction-related vibration levels at the Key Pier Substation are therefore expected to be below the architectural damage risk level. Construction-period impacts would also be documented and monitored (see Stipulation V of the MOA in Appendix O of this FEIS). As a result, vibration levels from construction of the Retrofit Existing Structure Alternative would not substantially impair the Key Pier Substation. Vibration from construction of the Retrofit Existing Structure Alternative would not result in proximity impacts to this Section 4(f) resource.

The attributes that qualify it for the NRHP, its association with the SFOBB and the Key System, would not be substantially impaired by proximity impacts of the Retrofit Existing Structure Alternative.

The Retrofit Existing Structure Alternative would not result in a Section 4(f) use of the Key Pier Substation.

Replacement Alternatives. None of the replacement alternatives would incorporate any land from the Key Pier Substation into the transportation facility, nor would they temporarily occupy any land from the Key Pier Substation.

The potential for constructive use was also evaluated. The attributes that qualify the Key Pier Substation for the NRHP, as a contributor to the SFOBB and a surviving building associated with the Key System, are not noise-sensitive attributes. There are no noise-sensitive activities associated with these attributes.

The primary views of the Key Pier Substation are from the roadway in front of it. Replacement Alternatives N-2 and N-6 would construct a structure farther away from the Key Pier Substation than the existing bridge; Replacement Alternative S-4 would construct a structure near the Key Pier Substation but in the opposite direction of the primary views. The replacement alternatives would not obstruct the primary views of this historic property. The Key Pier Substation does not derive its value in substantial part from its setting. Although any of the replacement alternatives would alter the location and appearance of the bridge, this would not substantially impair the attributes that qualify the Key Pier Substation for the NRHP, as a contributor to the SFOBB and a surviving building associated with the Key System.

The replacement alternatives would not result in any permanent change in access to this historic building, though access may be restricted during construction.

Under the replacement alternatives, the closest pile driving would be about 110 meters (360 feet) from the Key Pier Substation, and the closest foundation dismantling would be about 45 meters (150 feet) away. Construction-related vibration levels at the Key Pier Substation are therefore expected to be below the architectural damage risk level. Construction-period impacts would also be documented and monitored (see Stipulation V of the MOA in Appendix O of this FEIS). As a result, vibration levels from construction of the replacement alternatives would not substantially impair the Key Pier Substation. Vibration from construction of the replacement alternatives would not result in proximity impacts to this Section 4(f) resource.

The attributes that qualify the Key Pier Substation for the NRHP would not be substantially impaired by proximity impacts of the replacement alternatives.

The replacement alternatives would not result in a Section 4(f) use of the Key Pier Substation.

Archaeological Site

Section 4(f) applies to all archaeological sites on or eligible for inclusion on the NRHP, except when the archeological resource is important chiefly because of what can be learned by data recovery and it has minimal value for preservation in place (23 CFR §771.135[g][2]). The archaeological site on YBI, CA-SFr-04/H, is potentially eligible for the NRHP listing under Criterion D, and since this site has yielded and may again yield human remains, the SHPO concluded that its potential significance may extend beyond Criterion D. Evaluation of the site has resulted in the conclusion that the site is

important chiefly for the information it contains. It does not warrant preservation in place. Accordingly, Section 4(f) does not apply to this archaeological site.

6.8 COORDINATION

6.8.1 Historic Resources

Memorandum of Agreement. Compliance with Section 106 of the National Historic Preservation Act and its implementing regulations has been achieved through coordination among Caltrans, the FHWA, the SHPO, and the ACHP.

FHWA, SHPO, ACHP, and the USCG executed an MOA pursuant to Section 106 of the National Historic Preservation Act on May 26, 2000 (see Appendix O). Caltrans and various Native American individuals and groups are concurring parties. Other Native American individuals and groups, the Navy, the City of Oakland, and the City and County of San Francisco were invited to sign as concurring parties but did not respond. The MOA describes measures to reduce and mitigate adverse effects to historic properties and the archaeological site.

Historic Preservation Community

In April of 1997, letters were sent to the following organizations inviting their comments on this undertaking:

- American Society of Civil Engineers, History & Heritage Committee
- Berkeley Architectural Heritage Association
- California Preservation Foundation
- Foundation for San Francisco's Architectural Heritage
- National Trust for Historic Preservation, Western Regional Office
- Oakland Heritage Alliance
- Oakland Landmarks Preservation Advisory Board (LPAB)
- San Francisco Landmarks Preservation Advisory Board (LPAB)

In July of 1997, representatives of Caltrans attended a meeting of the Oakland LPAB and gave a brief presentation on the undertaking. This meeting was also attended by representatives from the Oakland Heritage Alliance, the California Preservation Foundation, and staff to the San Francisco LPAB.

The Oakland LPAB responded by letter on January 14, 1998, advocating that consideration be given to retrofit of the existing bridge rather than replacement and suggesting several mitigation measures if a replacement alternative is selected and the existing East Span is dismantled (see Appendix G). No other organizations responded to Caltrans' April 1997 invitation for comments on the undertaking. The San Francisco LPAB placed the project on the agenda of its January 2000 meeting; however, the item was deferred prior to the meeting, and it has not been taken up subsequently. Caltrans continues to coordinate with the Oakland LPAB regarding potential mitigation measures and other historic preservation issues associated with the East Span Project.

Staff and members of the Oakland LPAB and the CCSF have also attended and offered public comment at meetings of the MTC and MTC's Engineering and Design Advisory Panel regarding this project. They have also attended special focused meetings and project development team meetings.

Draft Section 4(f) Evaluation. The draft Section 4(f) evaluation was circulated to the public on September 23, 1998 together with the Draft Environmental Impact Statement (DEIS). Many of the above agencies submitted written comments on the draft Section 4(f) evaluation and the DEIS. Comments received on the draft Section 4(f) evaluation are included with the letters commenting on the DEIS; responses to these comments are in Volume II, Section 1 of the FEIS. There is also an index of Section 4(f)-related correspondence at the end of this final Section 4(f) evaluation.

The following DEIS comment letters contain comments about the draft Section 4(f) evaluation:

Department of the Interior ..... December 18,1998
City of Oakland, Landmarks Preservation Advisory Board..... November 23, 1998
California Preservation Foundation..... November 23, 1998
National Trust for Historic Preservation ..... November 23, 1998

The following additional DEIS comment letters comment on historic resources protected by Section 4(f) but do not refer to the draft Section 4(f) evaluation:

City of Oakland Planning Department ..... November 20, 1998
U.S. Navy ..... November 23, 1998
City and County of San Francisco Planning Department..... November 23, 1998

Supplemental Draft Section 4(f) Evaluation. The supplemental draft Section 4(f) evaluation was sent to the Department of the Interior and the following agencies and organizations on June 29, 1999:

- Advisory Council on Historic Preservation
- U.S. Navy
- U.S. Coast Guard
- U.S. Army
- Oakland Base Reuse Authority
- Port of Oakland
- East Bay Regional Park District
- California Preservation Foundation
- National Trust for Historic Preservation
- Oakland Landmarks Preservation Advisory Board
- San Francisco Landmarks Preservation Advisory Board
- Treasure Island Reuse Authority
- City of Oakland
- California Department of Parks and Recreation

The following letters commented on the supplemental draft Section 4(f) evaluation (see Volume II, Section 3, of the FEIS and the index of Section 4(f)-related correspondence at the end of this final Section 4(f) evaluation):

Department of the Interior ..... September 2, 1999
City of Oakland Planning Department ..... August 18, 1999
City and County of San Francisco, Treasure Island Project ..... August 24, 1999

Comments received on the draft Section 4(f) and the supplemental draft Section 4(f) were considered and, if appropriate, changes were made to this final Section 4(f) evaluation.

6.8.2 Gateway Park

Caltrans initiated coordination meetings with the EBRPD and the Port to discuss the East Span Project, land use issues, and Gateway Park development possibilities. The City of Oakland, the Army, the NPS, BCDC, and ABAG have also participated. Meetings to discuss the proposed park were held on October 7, 1997; November 18, 1997; February 18, 1998; May 20, 1998; July 22, 1998; December 2, 1998; February 10, 1999; and August 11, 1999. EBRPD has held other meetings since then regarding park planning; these have not included Caltrans or FHWA. Future interagency meetings are anticipated.

On October 29, 1998, EBRPD commented on the project DEIS in its relation to the proposed park (see Volume II, Section 1, of the FEIS). In addition, many interested agencies attended a meeting on March 11, 1999, to discuss each agency's perspective on the status of the Gateway Park.

EBRPD also commented on the supplemental draft Section 4(f) evaluation in a letter received September 15, 1999. Comments on the supplemental draft Section 4(f) evaluation are in Volume II, Section 3, of the FEIS. There is an index of Section 4(f)-related correspondence at the end of this final Section 4(f) evaluation.

6.8.3 Radio Beach

Caltrans consulted with the Port, owner and official having jurisdiction over Radio Beach, regarding the significance of Radio Beach as a publicly owned park or recreation facility. The Port provided written correspondence about Radio Beach on April 1, 1999 (see Appendix G of the FEIS). Caltrans also met on March 3, 2000, with the Port, EBRPD, and FHWA to discuss the disposition of Radio Beach (see section 6.7.2 of this final Section 4(f) evaluation for information about this meeting).

6.8.4 Summary of Formal Coordination with the Department of the Interior

The draft Section 4(f) evaluation was sent to the Department of the Interior in the DEIS on September 24, 1998. The Department of the Interior commented on the draft Section 4(f) evaluation in a letter dated December 18, 1998. This letter may be found in Volume II, Section 1, of the FEIS, along with responses to the comments.

A supplemental draft Section 4(f) evaluation was sent to the Department of the Interior on June 29, 1999. The Department of the Interior commented on the supplemental draft Section 4(f) evaluation in a letter dated September 2, 1998. This letter may be found in Volume II, Section 3, of the FEIS, along with responses to the comments.

Additional Participation by the National Park Service

The NPS participated in activities associated with the proposed Gateway Park in coordination with the East Span Project. NPS attended the following meetings and sent the following correspondence:

- 10/7/97: NPS attended a field review of the OARB property at the Oakland Touchdown. NPS explained its role in possible transfer of OARB property to the EBRPD through the Federal Lands to Parks Program. NPS also asked if an interpretive exhibit was being considered for the East Span Project during construction, if a replacement alternative is selected.

- 10/30/97: NPS sent a letter to Caltrans, affirming its offer of assistance and support to EBRPD, and noting its role in the Federal Lands to Parks Program as well as various options for property conveyance involving the Port and EBRPD.

- 11/4/97: NPS attended a Workshop meeting about pedestrian and bicycle access at the Oakland Touchdown.

- 2/18/98: NPS attended a park coordination meeting.

- 5/20/98: NPS attended a park coordination meeting.

- 6/2/98: NPS attended a park coordination meeting.

- 7/22/98: NPS attended a park coordination meeting.

- 3/11/99: NPS attended a meeting to discuss the status of the Gateway Park and Section 4(f). NPS stated its support for the park and its concerns that Alternative S-4 would adversely affect the park.

6.9 CONCLUSIONS

6.9.1 Basis for Concluding That There Are No Prudent and Feasible Alternatives to the Use of Section 4(f) Land

There are unique problems involved in the use of alternatives that avoid the use of the SFOBB. All potential build alternatives would result in the need to either extensively retrofit or remove the existing East Span. Either of these actions would result in a Section 4(f) use of the historic bridge. There is no build alternative that avoids all Section 4(f) uses.

The Retrofit Existing Structure Alternative would not require removal of the existing East Span. As such, it could be considered a means of minimizing harm to the SFOBB, a Section 4(f) resource, as compared to the replacement alternatives. However, the Retrofit Existing Structure Alternative should not be considered as a means of minimizing harm to the SFOBB. Under the Retrofit Existing Structure Alternative, the East Span would incur moderate to major damage in an MCE; it would not be open to emergency traffic shortly after an MCE, and normal traffic might never be allowed back on the bridge. This means that it would not meet lifeline criteria for providing post-earthquake relief access for emergency vehicles. As such, it does not fully meet purpose and need. In addition, the damage to this heavily used facility in an MCE would close the East Span for a period of months or years to conduct repairs or replacement. Furthermore, it does not avoid future harm to the SFOBB, since the bridge would require extensive repairs or replacement following an MCE. Therefore, its ability to minimize harm to the SFOBB would only be in effect until the bridge experiences an MCE. Since the Retrofit Existing Structure Alternative does not fully meet the project's purpose and need, it would lead to economic losses of extraordinary magnitude following an MCE, and it does not avoid future harm to the SFOBB, the Retrofit Existing Structure Alternative is not a prudent alternative.

The project alternatives evaluated, and the project alternatives considered and withdrawn, are discussed in Chapter 2 of the FEIS. Alternatives that avoid Section 4(f) uses are discussed in Section 5 of this final Section 4(f) evaluation.

6.9.2 Basis for Concluding That the Proposed Action Includes All Possible Planning to Minimize Harm to Section 4(f) Properties

As discussed previously, there is no build alternative that avoids a Section 4(f) use of the SFOBB. Other Section 4(f) uses must therefore be considered in order to establish which alternative results in the least harm to Section 4(f) resources.

None of the replacement alternatives avoids a Section 4(f) use of the Senior Officers' Quarters Historic District, because they all require the placement of columns within the district to support temporary detours. Of the replacement alternatives, only Replacement Alternative S-4 results in a Section 4(f) use of the proposed Gateway Park. This alternative would incorporate about 3 hectares (7.4 acres) of the proposed park land, constituting about half of the park; the land would be incorporated into the transportation facility and would not be restored to park use following the project.

The Preferred Alternative (Replacement Alternative N-6), Replacement Alternative N-2, and the Retrofit Existing Structure Alternative avoid the Section 4(f) use of the proposed Gateway Park. The Retrofit Existing Structure Alternative would permanently incorporate about 9.3 square meters (100 square feet) of the grounds of the Senior Officers' Quarters Historic District as a result of enlarging a column footing at the historic district boundary.

The permanent use of the historic district by the Retrofit Existing Structure Alternative may be avoided by selecting a replacement alternative. While there is a Section 4(f) use of the historic district by the replacement alternatives, it is temporary in nature, involving the placement of about six columns for temporary detours within vegetated areas of the district for a period of up to four years. Furthermore, Caltrans and FHWA have committed to restoring affected areas following project construction. As a result, the Section 4(f) use of the historic district by the replacement alternatives would not be readily apparent following implementation of the project and restoration measures. In contrast, the Retrofit Existing Structure Alternative would result in a permanent use of land from the district.

The signed MOA pursuant to the National Historic Preservation Act documents the commitments made by Caltrans and FHWA to minimize harm to the historic resources affected by each alternative for the project. The MOA is in Appendix O. The commitments made in the MOA constitute the means of minimizing harm to historic resources for each project alternative. These measures include, but are not limited to, monitoring of historic structures during construction; restoration of historic grounds after construction; restoration of any inadvertent damage to historic structures to the Secretary of the Interior's Standards; and various historical preservation measures for the SFOBB itself. See the MOA itself for a complete listing of the documented commitments.

6.9.3 Feasible and Prudent Alternative with the Least Net Harm to Section 4(f) Resources after Considering Mitigation

Replacement Alternatives N-2 and N-6 are the feasible and prudent alternatives with the least net harm to Section 4(f) resources after considering mitigation. On the basis of the previous consideration of the various Section 4(f) uses resulting from each project alternative and the measures to minimize harm, the FHWA concludes that Replacement Alternatives N-2 and N-6 result in the least harm to Section 4(f) resources. There is no difference between Replacement Alternatives N-2 and N-6 in terms of the application of Section 4(f). Replacement Alternative N-6 has been chosen as the Preferred Alternative over Replacement Alternative N-2 on the basis of other factors, including ease of construction of the main tower based on geologic conditions, aesthetic benefits such as enhanced drivers' views, and consistency with the regionally preferred alignment and design features as expressed by the MTC. See Chapter 2 of the FEIS for further discussion of the alternative selection process.

6.9.4 Concluding Statement

Based upon the above considerations, there is no feasible and prudent alternative to the use of land from the East Span of the SFOBB and the Senior Officers' Quarters Historic District, and the proposed action includes all possible planning to minimize harm to the East Span of the SFOBB and the Senior Officers' Quarters Historic District resulting from such use.

6.10 INDEX OF SECTION 4(f) CORRESPONDENCE

DEIS comment letters that addressed the draft Section 4(f) evaluation
(see Volume II, Section 1, of the FEIS)

- Department of the Interior, December 18, 1998
- City of Oakland Landmarks Preservation Advisory Board, November 23, 1998
- California Preservation Foundation, November 23, 1998
- National Trust for Historic Preservation, November 23, 1998

Other DEIS comment letters that discuss park resources or historic resources
(see Volume II, Section 1, of the FEIS)

- East Bay Regional Park District, October 29, 1998
- City of Oakland Planning Department, November 20, 1998
- U.S. Navy, November 23, 1998
- City and County of San Francisco Planning Department, November 23, 1998

Comment letters on the supplemental draft Section 4(f) evaluation
(see Volume II, Section 3, of the FEIS)

- Department of the Interior, September 2, 1999
- City of Oakland Planning Department, August 18, 1999
- City and County of San Francisco, Treasure Island Project, August 24, 1999
- East Bay Regional Park District, received September 15, 1999

Other Section 4(f) correspondence (see Appendix G of the FEIS)

- U.S. Coast Guard, August 12, 1998
- East Bay Regional Park District, October 29, 1998
- Port of Oakland, April 1, 1999

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