SECTION FOUR AFFECTED ENVIRONMENT

This section of the EIS describes existing environmental conditions in the study area. Sections 5 and 6 assess the potential direct, indirect, and cumulative impacts of the proposed and connected actions and the no action alternative on the existing conditions described in this section. The study area includes the proposed and connected project areas and additional areas that could be affected by the proposed and connected actions.

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4.1 Resources and Areas of Concern Dismissed from Detailed Analysis

To focus this EIS on significant issues, FEMA identified and selected topics for analysis through coordination with the cooperating agencies and through public scoping (see Section 7). Based on the scoping process and on preliminary data collection, FEMA determined that the proposed and connected actions and the alternatives would have no effect or minimal effect on the following resources and areas of concern and that these topics need not be analyzed in the EIS.

Coastal Zone. Under the Coastal Zone Management Act (16 U.S.C. § 1451 et seq.), an applicant for a federal license or permit to conduct an activity that would affect any land use, water use, or natural resource of the coastal zone is required to certify that the proposed activity is consistent with the state's coastal management program to the maximum extent practicable (16 U.S.C. § 1456(c)(3)(A)). FEMA complies with 15 CFR Part 930, Subpart F, which requires that federal assistance be consistent with approved coastal management programs.

The San Francisco Bay Conservation and Development Commission (BCDC) administers the Coastal Zone Management Act in the San Francisco Bay area through its coastal management program. BCDC's jurisdiction extends over all tidal areas of San Francisco Bay and a shoreline band extending 100 feet inland from the mean high-tide line. EBRPD's Miller/Knox Regional Shoreline is a shoreline park, but the proposed project areas in the park are 250 feet or more from the mean high-tide line and are therefore outside BCDC's coastal zone jurisdiction. No temporary access roads would be created in Miller/Knox Regional Shoreline as part of the proposed and connected actions, and removal of vegetation 250 feet from the shoreline would not affect the coastal zone. All other proposed and connected project areas are farther outside the coastal zone. This topic was therefore dismissed from further consideration.

Prime and Unique Farmland. The Farmland Protection Policy Act of 1981 (7 U.S.C. § 4201 et seq.) was enacted to minimize conversion of prime and unique farmland and farmland of statewide or local importance to nonagricultural uses and to ensure that federal programs are compatible with local, state, and private programs and policies to protect farmland. This topic was dismissed because the proposed and connected actions would not convert farmland to nonagricultural uses.

Wilderness Values. The Wilderness Act of 1964 (16 U.S.C. §§ 1131–1136) established the national wilderness preservation system. This topic was dismissed because no designated wilderness areas are in the study area.

Wild and Scenic Rivers. The Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§ 1271–1287) established the National Wild and Scenic Rivers System to preserve rivers with outstanding cultural, natural, or recreational values. The act applies to rivers designated as wild and scenic. This topic was dismissed because the study area contains no designated wild and scenic rivers. The nearest designated river is the American (Lower) River in Sacramento, 50 miles northeast of the study area.

Sacred Sites. Executive Order 13007 (Indian Sacred Sites) requires federal agencies to avoid adverse effects to Indian sacred sites and accommodate access to and ceremonial use of such sites by Indian religious practitioners. This topic was dismissed because no sacred sites are in the study area.

4.2 Biological Resources

The affected environment for biological resources includes a discussion of the regulatory setting (Section 4.2.1), common vegetation and wildlife (Section 4.2.2), sensitive biological resources (Section 4.2.3), and habitats of concern (Section 4.2.4).

4.2.1 Regulatory Setting

This section provides an overview of the applicable federal, state, and local regulations.

4.2.1.1 Federal Endangered Species Act

The federal Endangered Species Act (ESA) (42 U.S.C. §§ 1531–1544) provides guidance for the protection of federally listed species and the ecosystems on which they depend.

- **Section 7 (Interagency Consultation and Biological Assessments)**. Section 7 of the federal ESA (16 U.S.C. § 1536) requires federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) or the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS), as appropriate, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat.
- **Section 9 (Prohibited Acts).** Section 9 of the federal ESA (16 U.S.C. § 1538) prohibits the "take" of any plant, fish, or wildlife species listed under the federal ESA as endangered unless otherwise authorized by federal regulations. Under the federal ESA, "take" is to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct.
- **Section 10 (Permits and Exemptions).** Section 10 of the federal ESA (16 U.S.C. § 1539) allows the USFWS or NMFS to issue permits for direct take (10(a)(1)(A)) and "incidental take (10(a)(1)(B))" that would occur during a proposed non-federal project. Direct take is related to take that could occur for scientific research on a listed species or activities to enhance a listed species propagation or survival (e.g. abundance surveys, genetic research, relocations, capture and marking, and telemetric monitoring). Incidental take is related to adverse effects of a project on an endangered or threatened species. Anyone planning to conduct any activity that may "take" a threatened or endangered species must obtain approval to perform that activity. A habitat conservation plan (HCP) must accompany an application for an incidental take permit. The purpose of the habitat conservation planning process associated with the permit is to ensure there is adequate minimizing and mitigating of the effects of the authorized incidental take.

4.2.1.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. §§ 703–712) protects selected species of birds that cross international boundaries (i.e., species that occur in more than one country at some point during their annual life cycle). The law applies to the removal of nests,

eggs, and feathers. The MBTA (Division E, Title I, Section 143 of the Consolidated Appropriations Act, 2005, Public Law (PL) 108–447) amends the MBTA such that non-native birds or birds that have been introduced by humans to the United States or its territories are excluded from protection under the act. It defines a native migratory bird as a species present in the United States and its territories as a result of natural biological or ecological processes.

4.2.1.3 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA) of 1940 requires measures to prevent the harassment and take of bald eagles resulting from human activities. The act provides for the protection of the bald eagle and the golden eagle (as amended in 1962) by prohibiting the take, possession, sale, purchase, barter, transport, export, or import of any bald or golden eagle, alive or dead, including any part, nest, or egg unless allowed by permit.

The act applies to "associations, partnerships, and corporations" in addition to individuals. Therefore, as the action agencies, the subapplicants are responsible for compliance with the BGEPA.

4.2.1.4 Magnuson-Stevens Fishery Coordination and Management Act

The Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA) (16 U.S.C. 1801 et seq.), also known as the Sustainable Fisheries Act (PL 104-297), designates Essential Fish Habitat (EFH) for certain commercially managed marine and anadromous fish species. The EFH provisions of the MSFCMA are designed to protect fisheries habitat of commercially managed species, including anadromous fish species, from being lost because of disturbance and degradation. The MSFCMA requires all federal agencies to consult with the Secretary of Commerce on activities or proposed activities that are authorized, funded, or undertaken by that agency that may adversely affect EFH.

4.2.1.5 Executive Order 13112: Invasive Species

Executive Order 13112, Invasive Species, requires federal agencies to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts that invasive species cause. Specifically, Executive Order 13112 requires that federal agencies not authorize, fund, or implement actions that are likely to introduce or spread invasive species unless the agency has determined that the benefits outweigh the potential harm caused by invasive species and that all feasible and prudent measures to minimize harm have been implemented.

4.2.1.6 Executive Order 11990: Protection of Wetlands

Executive Order 11990, Protection of Wetlands, requires federal agencies to take action to minimize the destruction or modification of wetlands by considering both direct and indirect impacts to wetlands. Furthermore, Executive Order 11990 requires that federal agencies proposing to fund a project that could adversely affect wetlands consider alternatives to avoid such effects. FEMA's regulations implementing Executive Order 11990 are codified in 44 CFR § 9.

4.2.1.7 California Endangered Species Act

The California ESA (CESA) (Sections 2050 to 2085) mandates that state agencies not approve a project that would jeopardize the continued existence of or "take" species listed as threatened or endangered if reasonable and prudent alternatives are available that would avoid a jeopardy finding. Under CESA, "take" is an action or attempt to hunt, pursue, catch, capture, or kill.

4.2.1.8 California Fish and Wildlife Code Including Fully Protected Species and Bird Nesting Protections

The California Fish and Wildlife Code (CFGC) contains the following sections that protect wildlife in California.

- **Sections 3511, 4700, 5050, 5515 (Fully Protected Species).** The CFGC lists 37 fully protected species (CFGC Sections 3511, 4700, 5050, and 5515) and prohibits take or possession at any time of the species listed, with few exceptions.
- **Sections 3503, 3503.5, 3513 (Bird Nesting Protections).** Sections 3503 and 3503.3 of the CFGC state that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird except as otherwise provided by the code or any regulation made pursuant thereto.
- **Section 3503.5** prohibits the take, possession, or needless destruction of any nests, eggs, or birds in the orders Falconiformes (e.g., New World vultures, hawks, eagles, ospreys, falcons) or Strigiformes (e.g., owls).
- **Section 3513** prohibits the take or possession of any migratory nongame bird or part thereof, as designated in the MBTA. To avoid violation of the take provisions, it is generally required that project-related disturbance at active nesting territories be reduced or eliminated during the nesting cycle.
- **Section 1600 et seq. (Lake and Streambed Alteration).** Section 1600 et seq. of the CFGC requires notification to the California Department of Fish and Wildlife (CDFW) prior to any project activity undertaken in or near a river, stream, or lake that flows at least intermittently through a bed or channel.

4.2.1.9 California Native Plant Protection Act

The California Native Plant Protection Act (NPPA) (Sections 1900 to 1913 of CDFW) requires all state agencies to use their authority to carry out programs to conserve endangered and rare native plants. The NPPA gives the CDFW the power to designate native plants as "endangered" or "rare" and to protect endangered and rare plants from "take," as defined under CESA.

4.2.1.10 Local Tree Ordinances

Local tree protection ordinances are in place to protect coast live oak (*Quercus agrifolia*) trees and other tree species of a certain size within the proposed and connected project areas. These municipal tree ordinances generally have a permit or review process to evaluate proposed impacts to protected trees.

4.2.2 Vegetation and Wildlife

This section describes common vegetation communities and wildlife in the proposed and connected project areas but not the special-status species, which are addressed in Section 4.2.3. Aquatic features, including surface water and wetlands in the proposed and connected project areas, are also described in this section.

4.2.2.1 Methodology for Evaluating Vegetation Communities and Aquatic Features Including Wetlands

4.2.2.1.1 Baseline Condition Field Maps

The following were used as a baseline for existing vegetation conditions: high-quality aerial photographs from 2007 to 2008 (Microsoft Corporation Bing 2010), U.S. Geological Survey (USGS) topographic and aquatic features, vegetation maps for the Claremont-PDM and Strawberry Canyon-PDM proposed project areas (FEMA 2006a and 2006b), and vegetation maps for EBRPD parklands (EBRPD 2006). These data were overlain onto aerial photographs of the proposed and connected project areas using ArcGIS 9.3 mapping utilities to create baseline condition field maps.

4.2.2.1.2 Field Survey Methods

Field reconnaissance surveys were conducted in 2010 to characterize vegetation and aquatic communities within the proposed and connected project areas. Vegetation communities were characterized either by ground verifying baseline field data provided in the EBRPD Wildfire Hazard Reduction and Resource Management Plan Environmental Impact Report (EBRPD EIR) (EBRPD 2010) or mapped when existing vegetation data were unavailable. Aquatic features were identified using USGS data layers, 2010 National Wetlands Inventory (NWI) data (USFWS 2010a), and field verification. Because of the size of the area, mapping was conducted at a broad scale with a minimum mapping area of 200 square feet. Dominant plant species in bloom or otherwise recognizable were identified to a level necessary for vegetation community classification. Wildlife species observed or recognized by diagnostic sign (e.g., scat, track, prey remains, burrows, nests, bird songs, or calls) during the survey were identified and recorded.

Field efforts were conducted on foot where habitat features allowed (i.e., where dense cover or steep slopes did not preclude access). Binoculars from vantage points were used for inaccessible points. Some vantage points were from an adjacent ridge or adjacent dirt trails and fire roads; however, a few inaccessible areas were mapped based on aerial interpretation and extrapolation through review of similar aerial signatures.

4.2.2.1.3 Vegetation Mapping Classification

Mapping was conducted in general accordance with the California Native Plant Society (CNPS)' *A Manual of California Vegetation* (Sawyer et al. 2008). Naming conventions in the EBRPD EIR (EBRPD 2010) were used to describe locally distinct vegetation communities. The vegetation classification was based on dominant species in each plant community, subdominant plant species, cover type, structure, plant species composition, and consideration of the habitat

requirements of special-status wildlife and plant species potentially occurring in the proposed and connected project areas.

4.2.2.1.4 Aquatic Features Including Wetland Areas

Information on surface aquatic features and wetlands was obtained through USGS data layers on perennial and intermittent streams and 2010 NWI data (USFWS 2010a). In addition, large wetland areas were identified and noted during the field surveys. No formal jurisdictional delineation of wetlands or waters was completed.

4.2.2.2 Vegetation Communities

The proposed and connected project areas consist of a mosaic of different plant communities, including grassland, shrub, forest, riparian, and disturbed vegetation communities. For the wildlife discussions in this EIS, "vegetation community" and "habitat" are synonymous.

Naming conventions for vegetation communities are based primarily on those described in the EBRPD EIR (EBRPD 2010) and *A Manual for California Vegetation* (Sawyer et al. 2008). In addition, plants are designated as invasive if they were rated by the California Invasive Plant Council (Cal-IPC) as either moderate or high (Cal-IPC 2006). Some vegetation communities described in the EBRPD EIR, such as serpentine bunchgrass grassland, are present only in small patches in the proposed and connected project areas. An additional vegetation community, successional grassland, has also been included in this document because of observed changes in vegetation communities between surveys conducted for the EBRPD EIS from 2006 through 2008 and surveys conducted for the proposed action in November 2010.

The vegetation communities in the proposed and connected project areas are described below. Figures 4.2-1a through 4.2-1j show the vegetation communities in the project areas, and Table 4.2-1 presents total acreages of each vegetation community. The acreages in the figures add up to more than the total acreages in Table 4.2-1 because the areas shown in the figures overlap. Table 4.2-2 lists the CDFW status of five locally distinct vegetation communities and their potential to occur in the proposed and connected project areas based on the California Natural Diversity Database (CNDDB 2012) and field surveys. Northern maritime chaparral is the only locally distinct vegetation community present in the project areas. Small patches of two other sensitive vegetation communities, serpentine bunchgrass and coastal terrace prairie, also occur as described below.

Table 4.2-1. Vegetation Communities in the Proposed and Connected Project Areas

Vegetation Community	Acres[1]
Oak-Bay Woodland	320.6
Eucalyptus Forest	824.3
Northern Coastal Scrub	159.2
Coyote Brush Scrub	330.5
Developed/Disturbed/Landscaped	112.7
Coniferous Forest	156.9
Successional Grassland	107.7
California Annual Grassland	22.0
Riparian Woodland	14.5
Redwood Forest	6.2
Northern Maritime Chaparral	4.3
Total	**2059.0**

[1] Acreages were calculated using geographic information system (GIS) shapefiles of the proposed and connected project areas from the subapplicants, vegetation shapefiles from EBRPD, and shapefiles mapped during field efforts from November 2010 as described in Section 4.2.2.1.1.

Table 4.2-2. CDFW Status of Five Locally Distinct Vegetation Communities and Their Potential to Occur in the Proposed and Connected Project Areas

Vegetation Community Type	CDFW Status	Potential To Occur in the Proposed and Connected Project Areas
Coastal Terrace Prairie	Sensitive	**Present.** Small patches are present in the Miller/Knox Regional Shoreline area.
Northern coastal salt marsh	Sensitive	**No potential.** The community is not present in the proposed and connected project areas. There were no observations of the community during field surveys, and there are no CNDDB occurrences in the proposed and connected project areas.
Northern maritime chaparral	Sensitive	**Present.** There are two CNDDB occurrences present in the proposed and connected project areas at Sobrante Ridge and Huckleberry Botanic Regional Preserves.
Serpentine bunchgrass	Sensitive	**Low Potential.** Occurs in at the Skyline Serpentine Prairie in Redwood Regional Park, which is protected and managed by the EBRPD and not within the proposed and connected project areas. However, the CNDDB occurrence map overlaps with the proposed and connected project areas in the southernmost portion of Redwood Regional Park and Anthony Chabot Regional Park.
Valley Needlegrass Grassland	Sensitive	**No potential.** The community is not present in the proposed and connected project areas. There were no observations of the community during field surveys, and there are no CNDDB occurrences in the proposed and connected project areas.

CDFW = California Department of Fish and Wildlife
CNDDB = California Natural Diversity Database 2012

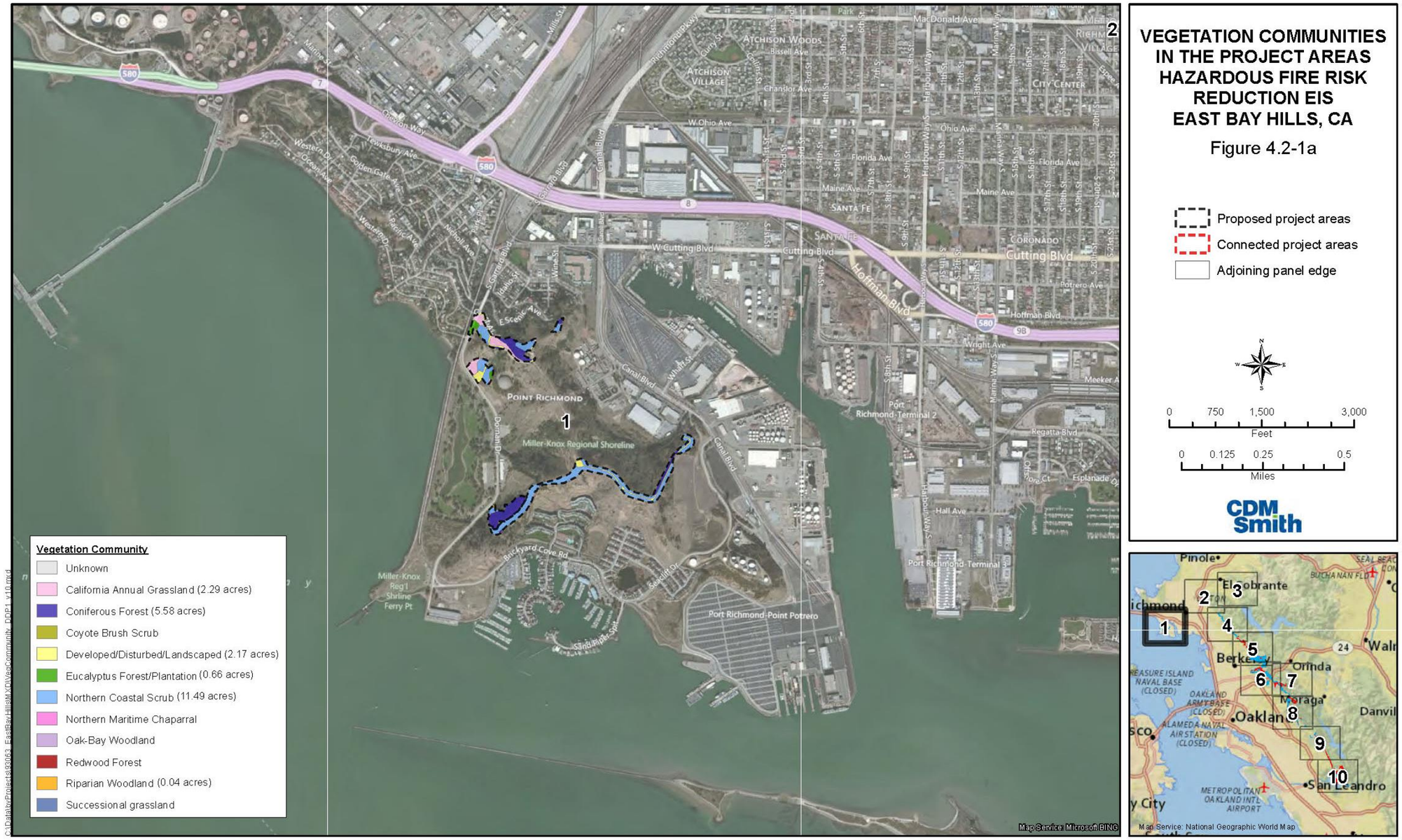

Figure 4.2-1a. Vegetation Communities in the Proposed and Connected Project Areas

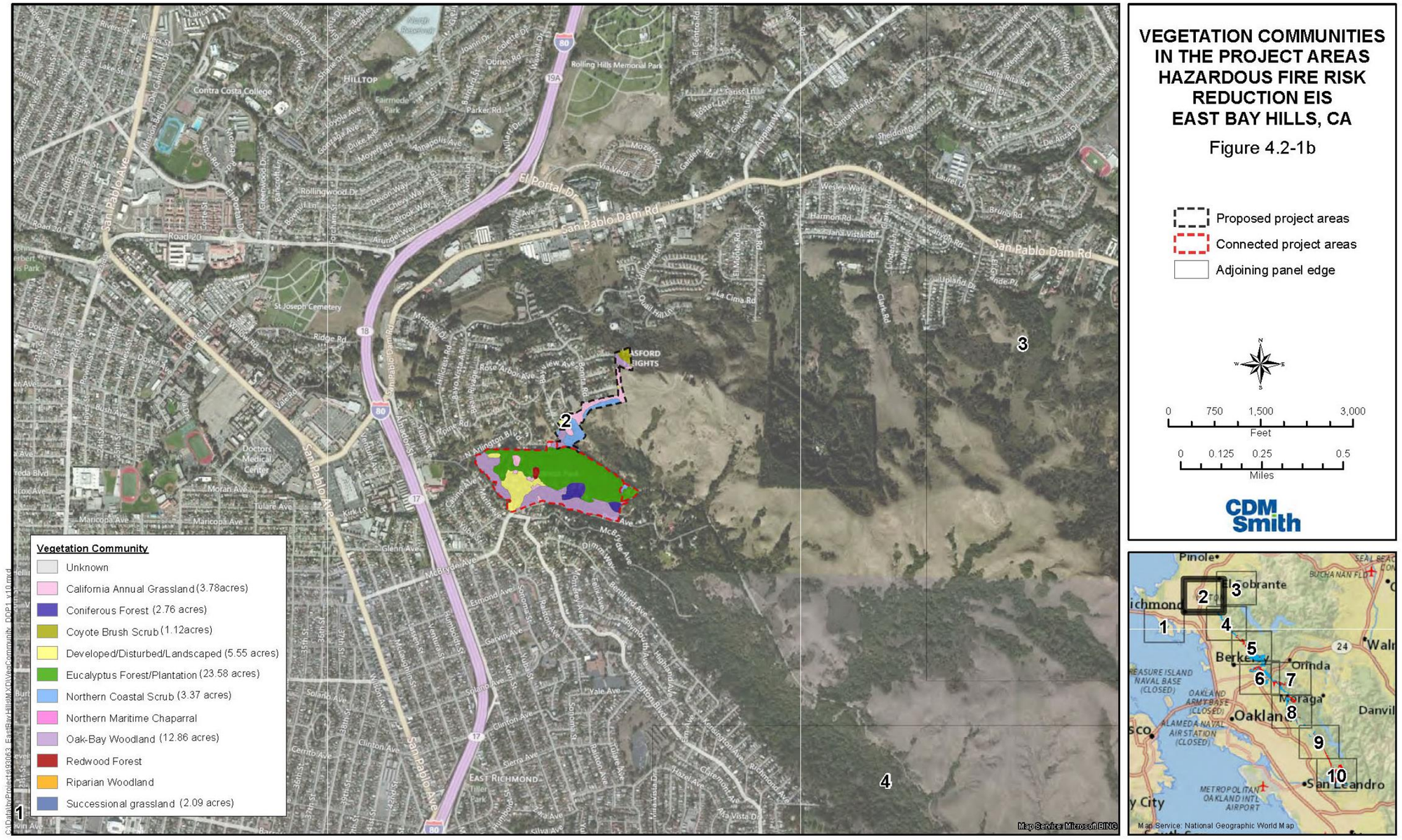

Figure 4.2-1b. Vegetation Communities in the Proposed and Connected Project Areas

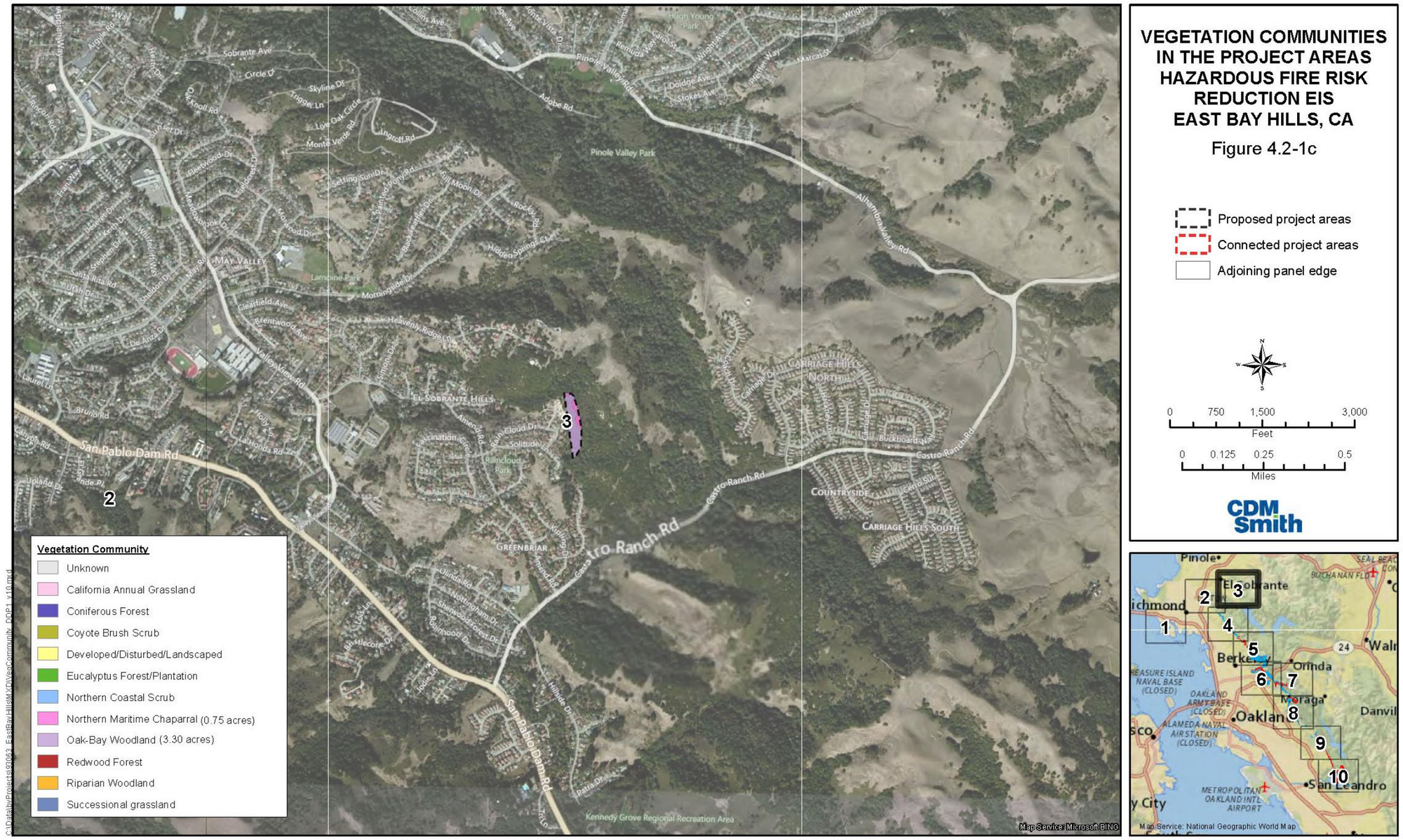

Figure 4.2-1c. Vegetation Communities in the Proposed and Connected Project Areas

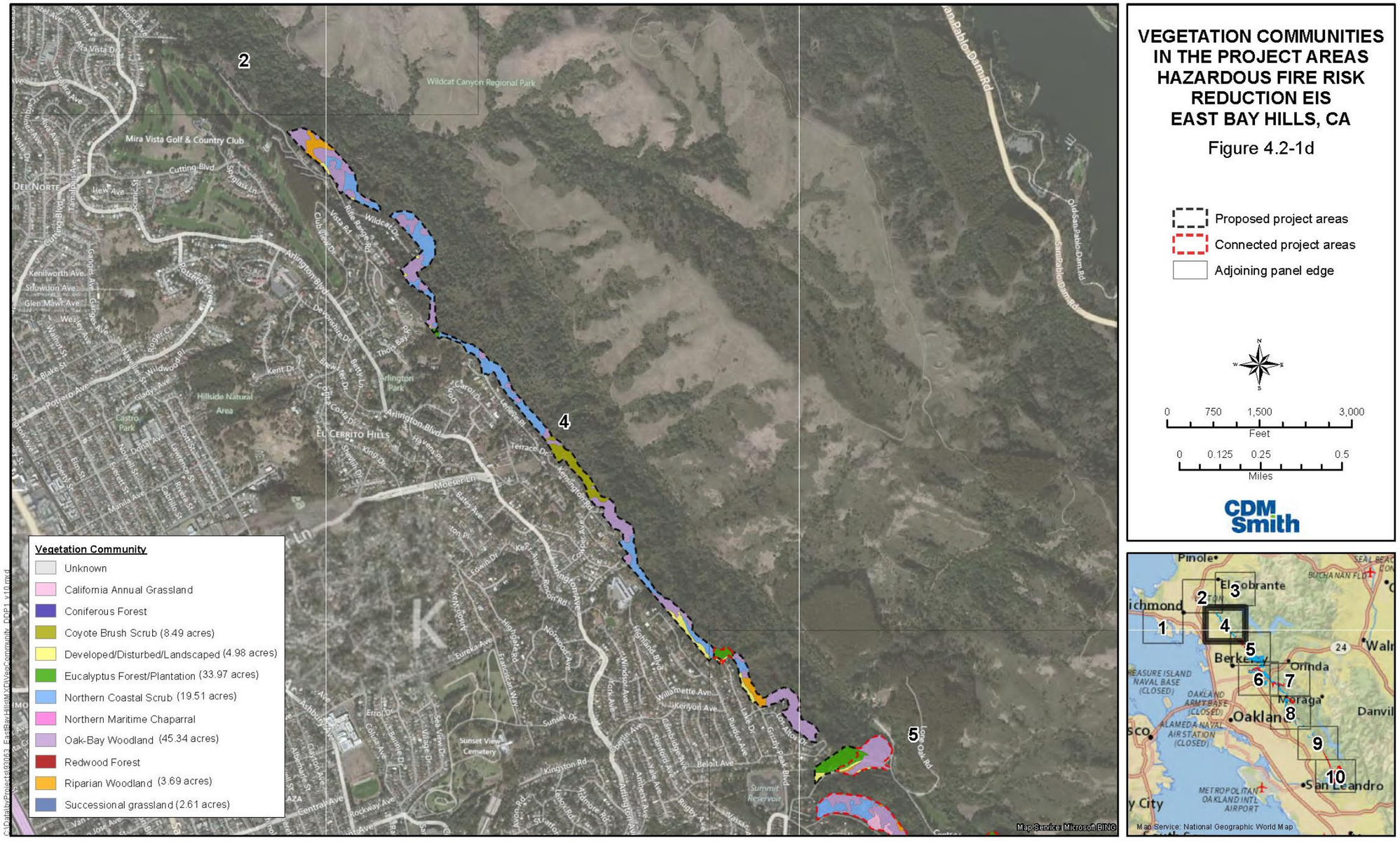

Figure 4.2-1d. Vegetation Communities in the Proposed and Connected Project Areas

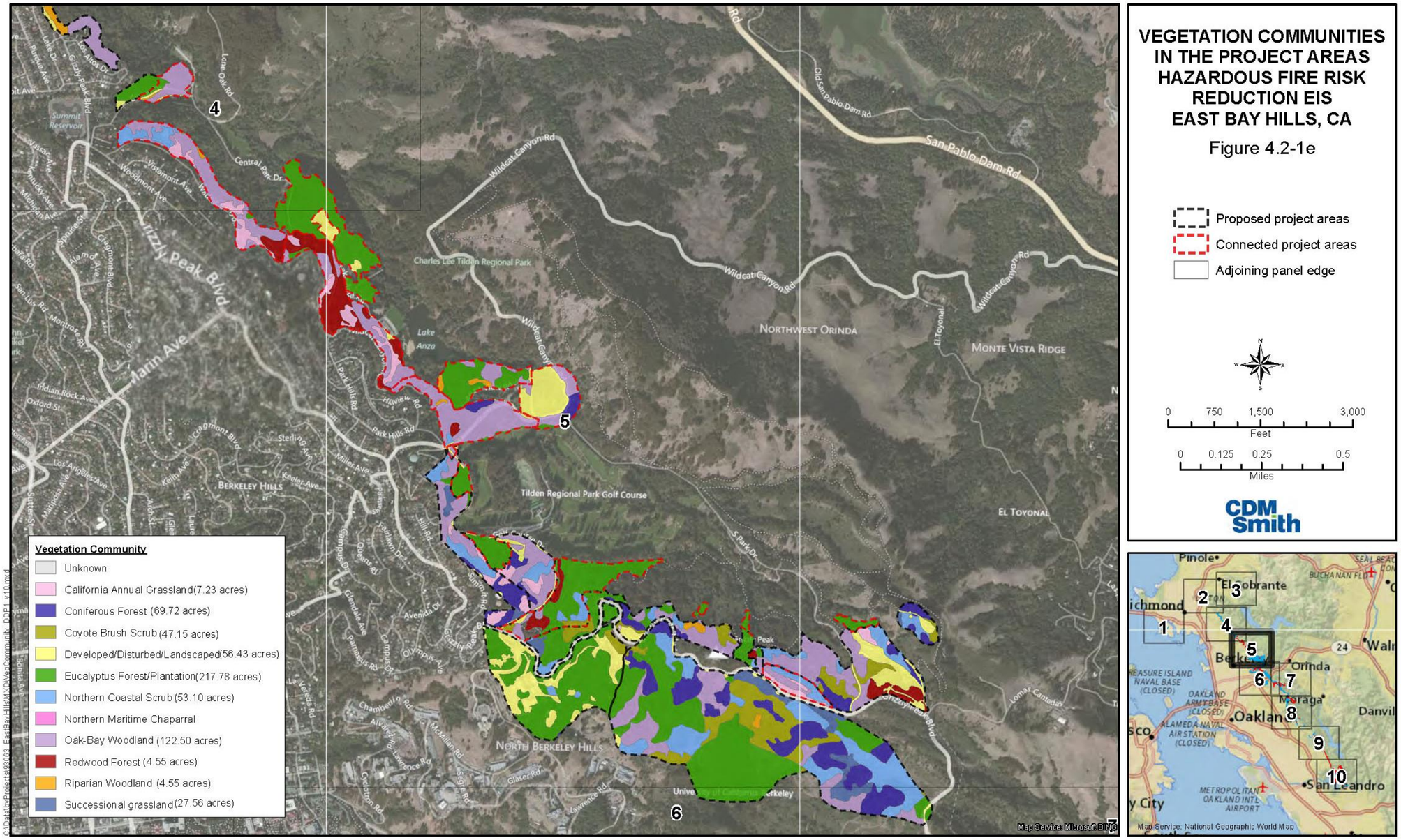

Figure 4.2-1e. Vegetation Communities in the Proposed and Connected Project Areas

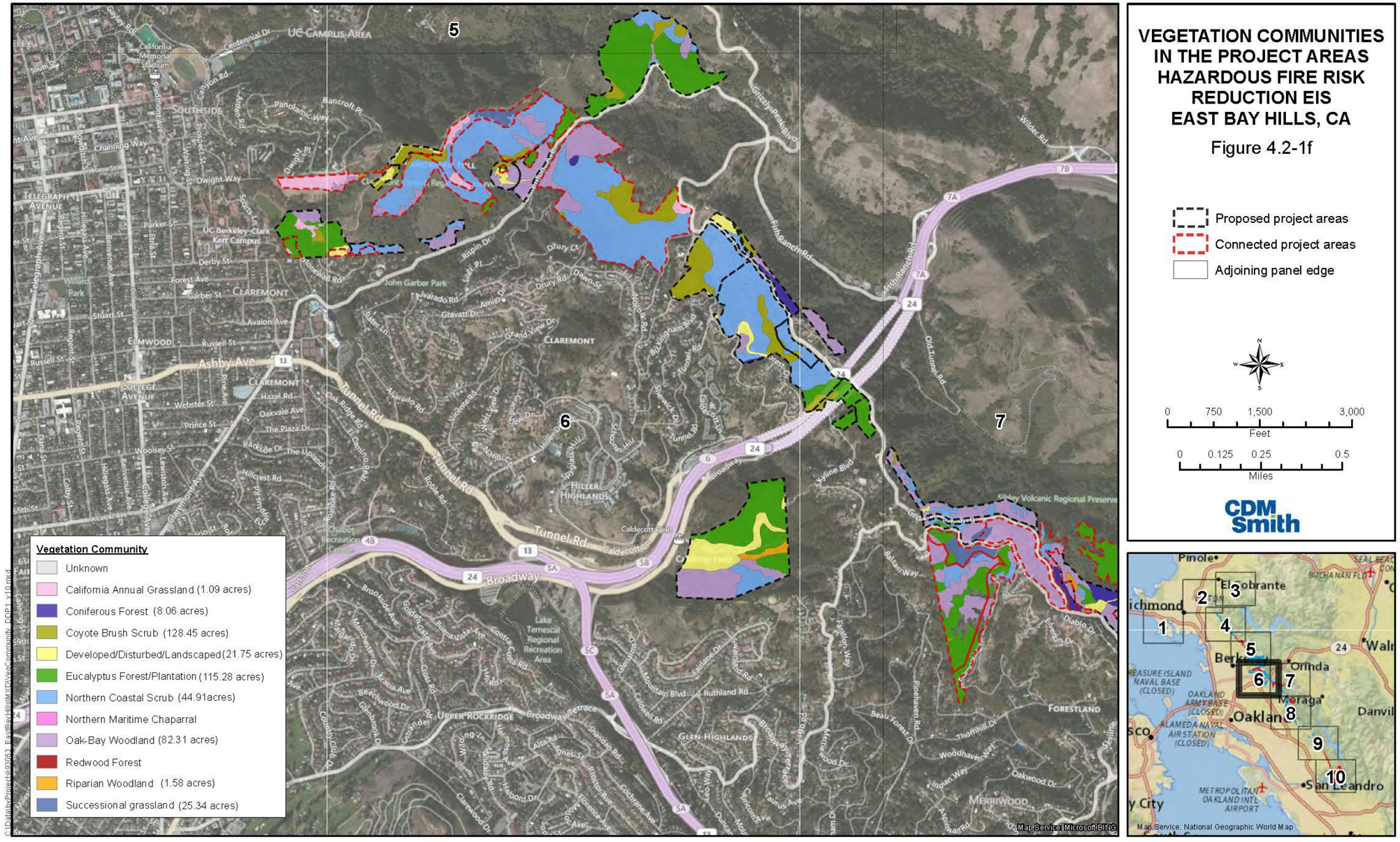

Figure 4.2-1f. Vegetation Communities in the Proposed and Connected Project Areas

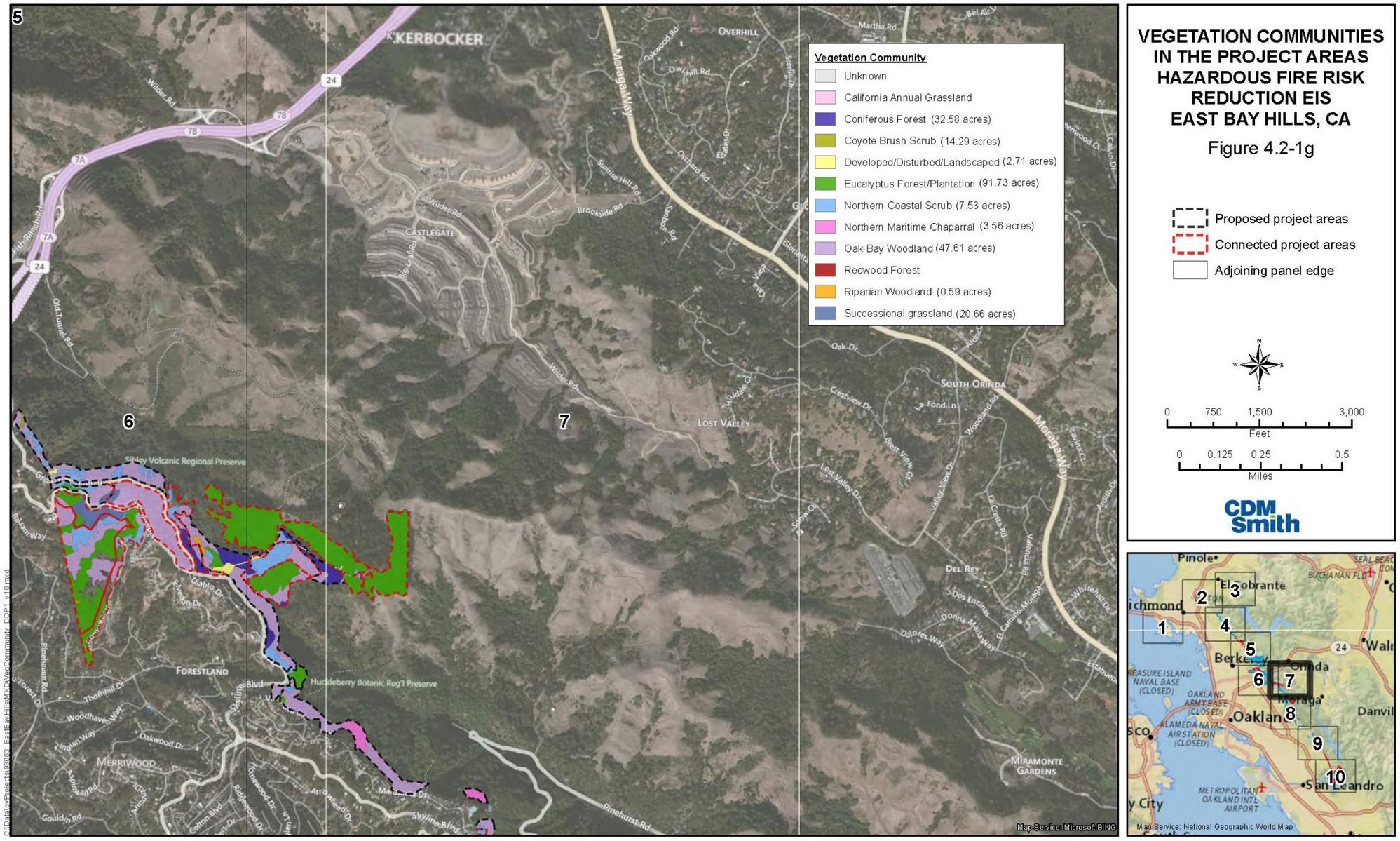

Figure 4.2-1g. Vegetation Communities in the Proposed and Connected Project Areas

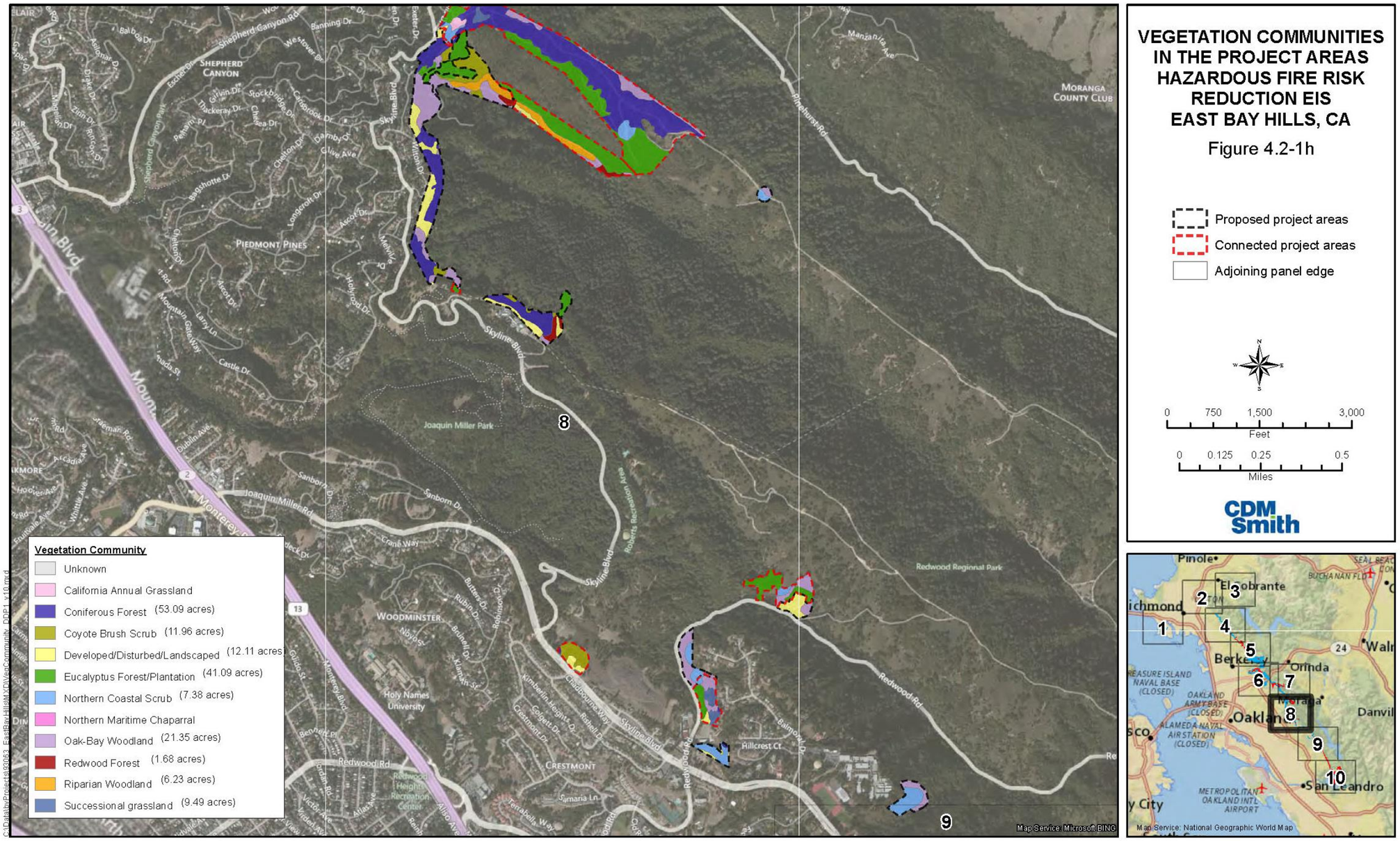

Figure 4.2-1h. Vegetation Communities in the Proposed and Connected Project Areas

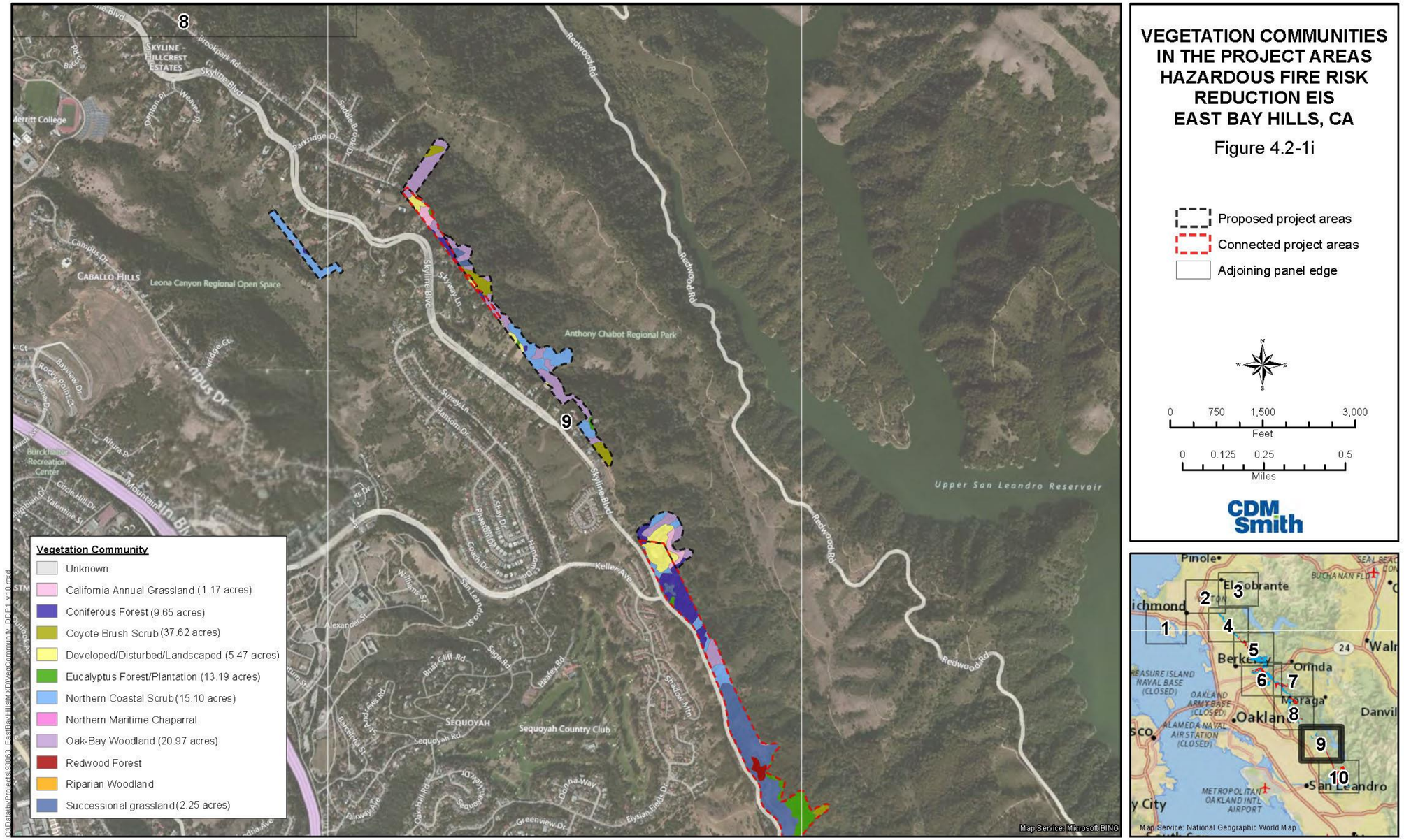

Figure 4.2-1i. Vegetation Communities in the Proposed and Connected Project Areas

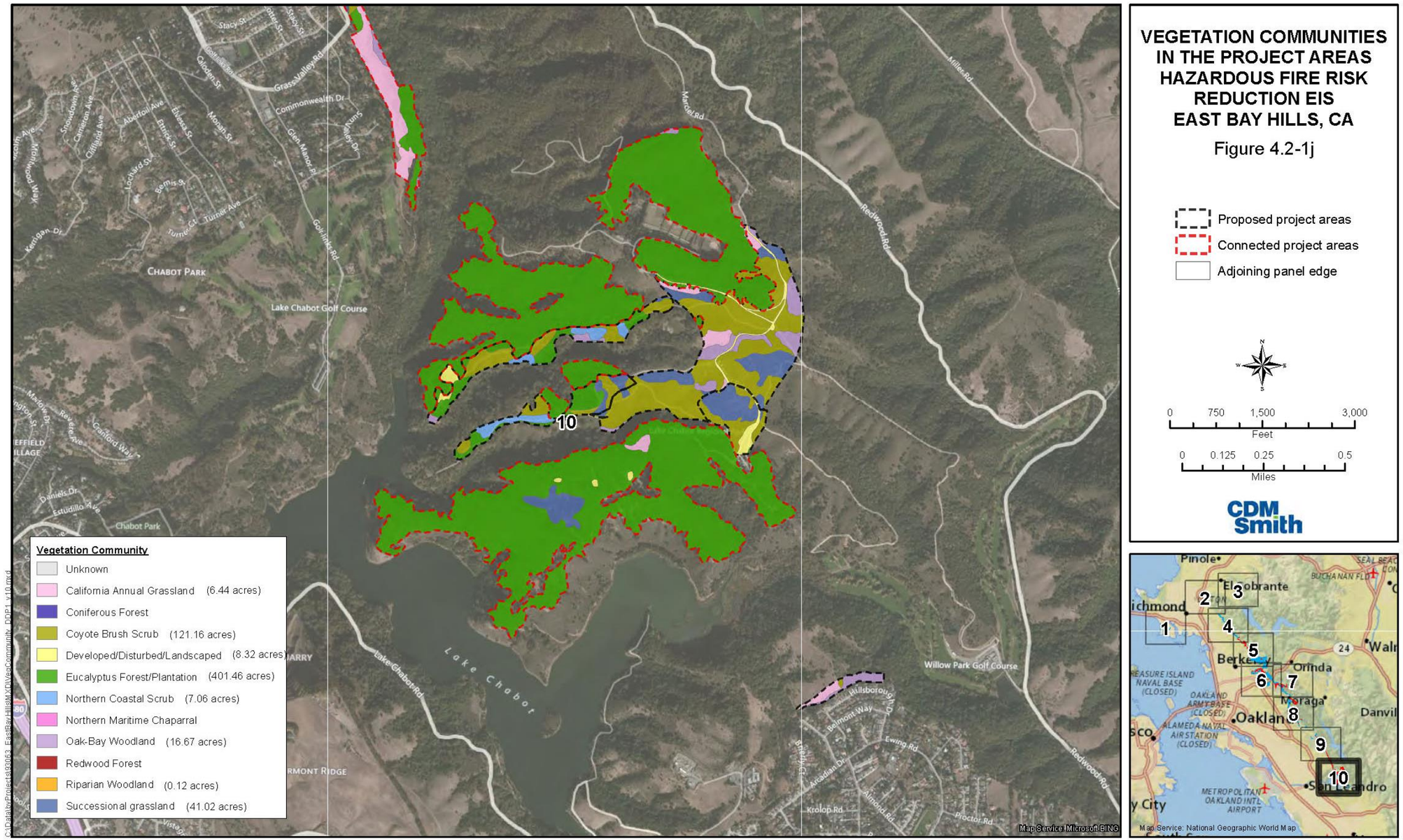

Figure 4-1j. Vegetation Communities in the Proposed and Connected Project Areas

4.2.2.2.1 Oak-Bay Woodland

The oak-bay woodland community consists of a mix of predominantly coast live oak (*Quercus agrifolia*) and California bay (*Umbellularia californica*) trees. Other native trees found in this vegetation community in the proposed and connected project areas include California buckeye (*Aesculus californica*), bigleaf maple (*Acer macrophyllum*), and madrone (*Arbutus menziesii*). Monterey pine (*Pinus radiata*) and eucalyptus (*Eucalyptus globulus* and *E. camaldulensis*) were also observed in oak-bay woodlands, such as along the Grizzly Peak Trail and the Tilden Golf Course in Tilden Regional Park and in Sibley Volcanic Regional Preserve. Oak-bay woodlands total 320.6 acres in the proposed and connected project areas and represent the second largest vegetation community identified in the proposed and connected project areas.

In areas where a closed tree canopy exists, such as along Redwood Road in Redwood Regional Park, the understory is sparse and consists of species, such as poison oak (*Toxicodendron diversilobum*), woodfern (*Dryopteris arguta*), and swordfern (*Polystichum munitum*). In oak-bay woodlands with a more open canopy, such as along Seaview Drive and in Anthony Chabot Regional Park, a greater diversity of shrubs and herbaceous plants are present in the understory. Native species observed in these more open oak-bay woodlands include California blackberry (*Rubus ursinus*), coyote brush (*Baccharis pilularis*), California hazelnut (*Corylus cornuta*), toyon (*Heteromeles arbutifolia*), and currants (*Ribes* spp.). Herbaceous plants may include hound's-tongue (*Cynoglossum grande*), alumroot (*Heuchera micrantha*), starflower (*Trientalis latifolia*), and slim Solomon's seal (*Smilacena stellata*). Non-native species found in oak-bay woodlands include forget-me-not (*Myosotis latifolia*) and invasive species, such as Himalayan blackberry (*Rubus armeniacus*) and fennel (*Foeniculum vulgare*).

4.2.2.2.2 Eucalyptus Forest

Eucalyptus trees were introduced from Australia and were widely planted throughout the East Bay Hills in the early 1900s (O'Brian 2005). Eucalyptus trees are capable of rapid growth and prolific reproduction. A rapid growth rate and the production of allelopathic oils, which inhibit establishment of other species, have helped eucalyptus forests invade large areas of the East Bay Hills. Eucalyptus forest encompasses 824.3 acres of the proposed and connected project areas and is the largest vegetation community on site.

Eucalyptus stands in the proposed and connected project areas range between young stands (i.e., less than 20 years old) of recently colonized saplings to mature stands (i.e., over 20 years old) that have never been logged. Blue gum eucalyptus (*Eucalyptus globulus*) is the dominant species; however, red gum eucalyptus (*Eucalyptus camaldulensis*) also occurs. Young stands of eucalyptus occur in Sibley Volcanic Regional Preserve and near the UCB campus (i.e., at Strawberry Canyon-PDM and Claremont-PDM) and consist of second-growth trees sprouting from the cut stumps of the originally planted trees. The understory of these young stands supports a more diverse mix of native and non-native shrubs and herbaceous plants when compared to those in the mature stands. Native species in this community include California blackberry, poison oak, toyon, and coyote brush; non-native invasive species include cotoneaster (*Cotoneaster* spp.), French broom (*Genista monspessulana*) and Scotch broom (*Cytisus scoparius*), erect veldtgrass (*Ehrharta erecta*), and occasionally the non-native oblong spurge (*Euphorbia oblongata*).

Mature eucalyptus forests characterized by a closed-canopy and sparse shrub and forb understory are present in Tilden Regional Park and Anthony Chabot Regional Park. The dense canopy and abundant litter results in an understory relatively devoid of vegetation; however, scattered individuals of poison oak, California blackberry, and non-native invasive English ivy (*Hedera helix*) were observed in these mature stands.

Scattered coast live oak and California bay trees are present in both young and mature eucalyptus stands. Additionally, coast redwood (*Sequoia sempervirens*) trees are occasionally present in stands of eucalyptus, such as along the Grizzly Peak Trail in Tilden Regional Park.

4.2.2.2.3 Northern Coastal Scrub

Northern coastal scrub (coastal scrub) communities are characterized by relatively open to dense woody shrub cover and an absence of trees. In the proposed and connected project areas, the northern coastal scrub encompasses 159.2 acres. Northern coastal scrub communities in the proposed and connected project areas include both xeric (i.e., dry) and mesic (i.e., moist) conditions. The proposed and connected project areas are dominated by shrubs and forbs adapted to relatively xeric conditions. Coyote brush is the dominant shrub in xeric coastal scrub communities in the proposed and connected project areas. Other shrub species present include California sagebrush (*Artemisia californica*), toyon, silver bush lupine (*Lupinus albifrons*), poison oak, black sage (*Salvia mellifera*), and sticky monkey-flower (*Mimulus aurianticus*). Scattered coast live oak, California bay, and Monterey pine trees also occur in this community. Non-native invasive species commonly observed in coastal scrub include French broom and fennel. French broom is prevalent in the northern coastal scrub communities of Anthony Chabot Regional Park, Miller/Knox Regional Shoreline, and near Skyline High School.

Coastal scrub communities dominated by species adapted to more mesic (i.e., moist) conditions are also present in the proposed and connected project areas although less common than xeric coastal scrub communities. The dominant plant species observed in mesic coastal scrub include California blackberry, thimbleberry (*Rubus parviflorus*), blue elderberry (*Sambucus mexicanus*), and California hazelnut. Non-native invasive species in this community include poison hemlock (*Conium maculatum*), Italian thistle (*Carduus pycnocephalus*), and Himalayan blackberry. Scattered coast live oak and California bay, as well as madrone and bigleaf maple, are also occasionally present in this community. This community is present in the proposed and connected project areas along the Grizzly Peak Trail south in Tilden Regional Park and adjacent to the North Oakland Sports Center.

The xeric coastal scrub community at Miller/Knox Regional Shoreline differs from the other coastal scrub communities in the proposed and connected project areas. The ocean-side slopes in this locale support California buckwheat (*Eriogonum fasciculatum*), a native shrub species that was not observed elsewhere in the proposed and connected project areas. These slopes also exhibit sparser shrub cover because of the presence of small patches of coastal prairie vegetation. The coastal prairie vegetation community is identified by the CNDDB as a sensitive plant community based on its rarity rank by CDFW [California Department of Fish and Game (CDFG) 2009] and typically consists of a diverse array of native perennial bunchgrasses (Amme 2004; Ford and Hayes 2007). In the Miller/Knox Regional Shoreline area, native grasses in coastal prairie patches include seashore bentgrass (*Agrostis pallens*), junegrass (*Koeleria macrantha*),

and red fescue (*Festuca rubra*). These areas of coastal prairie were not mapped because the patch sizes were much smaller than the minimum mapping area identified in the methods for this project.

4.2.2.2.4 Coyote Brush Scrub

Coyote brush scrub is a successional stage from grassland to scrub and commonly occurs where grazing or fire has been discontinued or suppressed. Coyote brush scrub is distinct from northern coastal scrub by the density of coyote brush and low cover of other shrubs species, such as California sagebrush and poison oak. In areas of dense coyote brush, little or no understory is present; however, herbaceous grass and forb species, such as wild oats (*Avena* spp.), blue wild rye (*Elymus glaucus*), and bracken fern (*Pteridium aquilinum*), occur along edges or in open areas. Non-native invasive species, such as Italian thistle and French broom, also are commonly present in disturbed areas in this community. Scattered trees, such as eucalyptus, California bay, and Monterey pine, were identified in coyote brush scrub communities. In the proposed and connected project areas, this community ranges from relatively open stands of coyote brush in Anthony Chabot Regional Park to areas of almost pure stands of coyote brush along Grizzly Peak Boulevard. Large stands of coyote brush scrub were identified near Tilden Regional Park south side of Grizzly Peak Road, Sibley Volcanic Regional Preserve, Redwood Regional Park, and Anthony Chabot Regional Park. This community covers 330.5 acres in the proposed and connected project areas.

4.2.2.2.5 Developed/Disturbed/Landscaped

Developed, disturbed, and landscaped areas consist of land developed for residential and urban use, including landscaped and maintained residential and park land, as well as areas used for road and trail construction and maintenance. Vegetation in these areas is predominantly planted trees, shrubs, and non-native herbaceous species. A large variety of ornamental trees and shrubs were observed in this community.

Developed, disturbed, and landscaped areas encompass 112.7 acres of the proposed and connected project areas and consist primarily of private residences; large buildings, structures, and parking lots, such as the Chabot Space and Science Center parking lot and the UCB Mathematical Sciences Research Institute Building; and public roads. Landscaped areas include maintained yards associated with private residences and planted or maintained areas associated with public or regional park buildings, such as the mowed grassland in the Chabot Riding Stable area of Anthony Chabot Regional Park. In addition, maintained (i.e., mowed) and/or landscaped recreational areas are present, such as the mowed grass playing fields of the North Oakland Sports Complex.

Disturbed vegetation includes areas created by natural or human disturbance that may support early successional stages of adjacent habitats. Disturbed areas are often susceptible to invasion by non-native species, including weeds, such as French broom, fennel, poison hemlock, and Italian thistle. Disturbed areas were identified in a variety of locations, including areas near new development, along road shoulders, or on hillsides, such as the hillsides along portions of Grizzly Peak Boulevard.

4.2.2.2.6 Coniferous Forest

The coniferous forest community in the proposed and connected project areas is dominated by Monterey pine, which is native only to San Mateo, Monterey, and San Luis Obispo Counties. It was planted in the East Bay Hills in the early 1900s. Similar to other woodland and forest communities, the understory is typically sparse, and the ground is covered mostly by pine needles. In more open canopied Monterey pine forests, native shrub species, such as California blackberry, coyote brush, and poison oak are common. Non-native species commonly observed in Monterey pine forests include erect veldtgrass, fennel, and poison hemlock.

The coniferous forest community covers 156.9 acres of the proposed and connected project areas. Mature groves of varying densities of Monterey pine occur throughout the proposed and connected project areas, often with eucalyptus, coast live oak, and California bay trees. Near the Tilden Golf Course in Tilden Regional Park, Douglas-fir (*Pseudotsuga menziesii*) is a co-dominant species with Monterey pine, and near Skyline High School (near Redwood Regional Park), the forest community is a mix of Monterey pine and coast redwood. In parts of the proposed and connected project areas, such as in Miller/Knox Regional Shoreline and along Grizzly Peak Boulevard above the Caldecott Tunnel, Monterey pines are present and appear to be colonizing areas of coastal scrub.

4.2.2.2.7 Successional Grassland

The successional grassland community is characterized by grassland areas that appear to be in the process of transitioning into shrub-dominated communities. Vegetation consists primarily of non-native annual grasses and forb species found in California annual grasslands but with a higher cover of shrub species, typically coyote brush, than typically occurs in California annual grassland communities. In some areas, fire suppression and cessation of livestock grazing in the East Bay Hills have resulted in the succession of California annual grasslands into coyote brush scrub and coastal scrub communities (Stromberg et al. 2007). Vegetation management practices, including clearing eucalyptus stands, have also produced areas of successional grassland as shrubs have recolonized the area.

The successional grassland community encompasses 107.7 acres of the proposed and connected project areas. Although coyote brush is the dominant shrub, other species – such as sticky monkey-flower, poison oak, and occasional immature coast live oak – California bay, and other saplings were also observed. A majority of the successional grassland community present in the proposed and connected project areas is found in Anthony Chabot Regional Park and along the west side of Grizzly Peak Road on the opposite side of Tilden Regional Park.

4.2.2.2.8 California Annual Grassland

California annual grassland, also known as non-native annual grassland, is a predominantly herbaceous community, typically composed of a dense cover of introduced annual grasses and non-native and native forbs adapted to colonizing and persisting in disturbed upland habitats. Native grasses and perennial forbs may also occur sporadically in the California annual grassland community.

California annual grasslands are scattered throughout the proposed and connected project areas; large patches were identified in the Lake Chabot area. This community encompasses 22.0 acres in the proposed and connected project areas. Dominant non-native invasive grasses include wild oats, ripgut brome (*Bromus diandrus*), hare barley (*Hordeum marinum* ssp. *leporinum*), and annual fescues (*Vulpia* spp.). Common non-native forbs observed include burclover (*Medicago polymorpha*), rose clover (*Trifolium hirtum*), and filarees (*Erodium* spp.). Non-native invasive annual forbs, such as fennel and Italian thistle, are present in California annual grassland communities where soils have been disturbed.

Scattered native grasses, including purple needlegrass, blue wild rye, and creeping wild rye (*Leymus triticoides*), occur sparingly in this community in the proposed and connected project areas. Native forbs present include California poppy (*Eschscholzia californica*), yarrow (*Achillea millefolium*), clovers (*Trifolium* spp.), and blue-eyed grass (*Sisyrinchium bellum*). Scattered native shrubs, primarily coyote brush, were also commonly observed in California annual grasslands; however, cover of shrubs is generally less than 5% in this community type.

4.2.2.2.9 Riparian Woodland

Riparian woodland communities are located along streams and on the edges of seeps and ponds. Arroyo willow (*Salix lasiolepis*) is the dominant species in this community in the proposed and connected project areas. Scattered California bay and coast live oak trees were also identified adjacent to riparian woodland communities. California blackberry, thimbleberry, sword fern, and poison oak are commonly found in the understory. The most common non-native species identified in the proposed and connected project areas' riparian woodland communities are English ivy and poison hemlock. This vegetation community is uncommon in the proposed and connected project areas (a total of 14.5 acres were identified); the largest patch was identified along Redwood Creek in Redwood Regional Park.

4.2.2.2.10 Redwood Forest

Patches of coast redwood forests are found from southern Oregon to Big Sur, California. Coast redwood trees tend to be found on shallow soils on north- and east-facing slopes or in valley or canyon bottoms. In the proposed and connected project areas, natural redwood forest exists in Redwood Regional Park and in small patches in Anthony Chabot Regional Park. Coast redwood has also been planted in Claremont Canyon Regional Preserve and Tilden Regional Park.

The redwood forest community comprises 6.2 acres of the proposed and connected project areas. Observed redwood forests typically consist of a closed canopy of coast redwood trees with few if any other tree species. However, California bay and Monterey pine are co-dominant trees in patches of redwood forest along Seaview Drive and near Piedmont Stables in Redwood Regional Park. Shrubs and herbaceous species are relatively sparse in the understory of closed canopy redwood forests. Wild ginger (*Asarum caudatum*), western trillium (*Trillium ovatum*), and violets (*Viola glabella*; *V. sempervirens*) are abundant herbs in the understory of some groves. Evergreen huckleberry (*Vaccinium ovatum*), poison oak, ocean spray (*Holodiscus discolor*), and California hazelnut are sparsely distributed in the proposed and connected project areas.

4.2.2.2.11 Northern Maritime Chaparral

Northern maritime chaparral, also referred to as brittle-leaf–woolly leaf manzanita chaparral (Sawyer et al. 2008) is identified by the CNDDB as a sensitive plant community based on its rarity rank by CDFW (CDFG 2009). Maritime chaparral is typically found on soils with extremely low water-holding capacity and is dominated by native shrub species. Common shrubs identified in the proposed and connected project areas include brittle-leaf manzanita (*Arctostaphylostomentosa* ssp. *crustacea*), chinquapin [*Chrysolepis* (*Castanopsis*) *chrysophylla* var. *minor*], evergreen huckleberry, and sticky monkey-flower. Pallid manzanita (*Arctostaphylos pallida*), a state- and federally listed endangered plant species, is found in this community and was observed in Sobrante Ridge and Huckleberry Botanic Regional Preserves (see Section 4.2.3.3.1).

Northern maritime chaparral only comprises 4.3 acres in the proposed and connected project areas, the smallest amount of any vegetation community identified in the proposed and connected project areas. Restricted to relatively dry areas, this community was observed only in Sobrante Ridge and Huckleberry Botanic Regional Preserves. Northern maritime chaparral in both locations is dominated by brittle-leaf and pallid manzanita. The understory of this community includes scattered wood fern (*Dryopteris* spp.) and saplings of interior live oak (*Quercus wislizeni* var. *frutescens*) saplings. However, evergreen huckleberry and chinquapin are present in the Huckleberry Botanic Regional Preserve. Scattered trees, including interior live oak and coast live oak, are also present in this community.

4.2.2.2.12 Serpentine Bunchgrass

The serpentine bunchgrass vegetation community is dominated by native perennial bunchgrasses that occur on serpentine soils. As a habitat, it covers from 2,000 to 10,000 acres in California and is currently threatened (CDFG 2007). This vegetation community is not present in the proposed and connected project areas, but it does occur in the Skyline Serpentine Prairie in Redwood Regional Park (EBRPD 2009f).

The dominant grass species in the serpentine bunchgrass community is the native purple needlegrass (*Nassella pulchra*). Other native grasses include Torrey's melicgrass (*Melica torreyana*), Idaho fescue (*Festuca idahoensis*), slender wheatgrass (*Elymus trachycaulus*), blue wild rye (*Elymus glaucus*), California brome (*Bromus carinatus*), and junegrass (*Koeleria macrantha*). A diverse array of herbaceous species, such as yellow mariposa lily (*Calochortus luteus*), Ithuriel's spear (*Triteleia laxa*), harvest brodiaea (*Brodiaea elegans*), and sticky calycadenia (*Calycadenia multiglandulosa*), are also found in this community.

4.2.2.2.13 Coastal Terrace Prairie

Coastal terrace prairie is dense grassland dominated by native grass species. As a habitat it covers from 2,000 to 10,000 acres in California and is currently very threatened (CDFG 2007). Remnants of this community exist in the California annual grassland in the proposed and connected project areas in Miller/Knox Regional Shoreline. However, the remnants are so interspersed with the California annual grassland community that they cannot be distinguished on a mapping scale relevant to the proposed and connected project areas.

4.2.2.3 Common Wildlife

The proposed and connected project areas contain a large diversity of common wildlife species adapted to the various vegetation communities described above. These species are presented below by guild: birds, mammals, amphibians, reptiles, and invertebrates. This section is intended to describe representative common wildlife species in the proposed and connected project areas and is not a comprehensive list of wildlife species present in the East Bay area.

Common bird species in the proposed and connected project areas vary greatly by vegetation community and season because some species are year-round residents while others are winter or migratory visitors. Some common year-round residents include rock dove (*Columbia livia*), mourning dove (*Zenaida macroura*), Canada goose (*Branta canadensis*), Nuttall's woodpecker (*Picoides nuttallii*), downy woodpecker (*Picoides pubescens*), hairy woodpecker (*Picoides villosus*), black phoebe (*Sayornis nigricans*), western scrub jay (*Aphelocoma californica*), Steller's jay (*Cyanocitta stelleri*), American crow (*Corvus brachyrhynchos*), and common raven (*Corvus corax*). Other species include American robin (*Turdus migratorius*), northern mockingbird (*Mimus polyglottos*), house finch (*Carpodacus mexicanus*), California towhee (*Pipilo crissalis*), western bluebird (*Sialia mexicana*), violet-green swallow (*Tachycineta thalassina*), barn swallow (*Hirundo rustica*), Anna's hummingbird (*Calypte anna*), and chestnut-backed chickadee (*Poecile rufescens*). Winter visitors to large bodies of water adjacent to the proposed and connected project areas, such as Lake Chabot, include various waterfowl species, such as northern pintail (*Anas acuta*), northern shoveler (*Anas clypeata*), greater scaup (*Aythya marila*), and lesser scaup (*Aythya affinis*), hermit thrush (*Catharus guttatus*), fox sparrow *(Passerella iliaca*), yellow-rumped warbler *(Dendroica coronata)*, cedar waxwing (*Bombycilla cedrorum*), and pygmy nuthatch *(Sitta pygmaea)*. Raptors, or birds of prey, are also abundant in the proposed and connected project areas and include red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), Cooper's hawk (*Accipiter cooperii*), barn owl (*Tyoto alba*), great horned owl (*Bubo virginianus*), western screech owl (*Ottis chennicotti*) and turkey vulture (*Cathartes aura*).

Common amphibian species in the proposed and connected project areas are often found in oak-bay woodland and shrub communities and include California newt (*Taricha torosa*), yellow-eyed ensatina (*Ensatina eschscholtzii xanthoptica*), arboreal salamander (*Aneides lugubris*), and California slender salamander (*Batrachoseps attenuatus*).

Common reptile species in the proposed and connected project areas are often found in grassland, oak-bay woodland, scrub, or chaparral vegetation communities and include western fence lizard (*Sceloporus occidentalis*), western skink (*Eumeces skiltonianus*), common kingsnake (*Lampropeltis getula*), and western rattlesnake (*Crotalus oreganus*).

Typical small mammal species present include deer mouse (*Peromyscus maniculatus*), Norway rat (*Rattus norvegicus*), black rat (*Rattus rattus*), California vole (*Microtus californicus*), and Botta's pocket gopher (*Thomomys bottae*). Typical medium-sized mammal species present include desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), gray fox (*Urocyon cinereoargenteus*), and in some areas eastern fox squirrel (*Sciurus niger*). California ground squirrel (*Spermophilus beecheyi*) is not as common in the East Bay Hills as elsewhere in California, most likely because of past large-scale eradication programs and

urbanization. Larger mammal species include coyote (*Canis latrans*), raccoon (*Procyon lotor*), stripped skunk (*Memphitis memphitis*), Virginia opossum (*Didelphis virginiana*), white-tail deer (*Odocoileus virginianus*), and mountain lion (*Puma concolor*).

Common invertebrate species in the proposed and connected project areas are found throughout the vegetation communities and include Monarch butterflies (*Danaus plexippus*) and a variety of other insects and arachnids.

4.2.2.4 Aquatic Features Including Wetland Areas

This section describes the aquatic features that occur in the proposed and connected project areas and vicinity (5-mile radius). Riverine and lacustrine features (features associated with rivers and lakes, respectively) that occur in the proposed and connected project areas and vicinity include perennial creeks, intermittent drainages, and ponds. There are several large reservoirs in the vicinity. Wetland features include areas that are typically inundated or saturated by surface or groundwater and support vegetation or aquatic life that is adapted for life in saturated soils. Figures 4.5-1a through 4.5-1f depict aquatic features in the proposed and connected project areas.

4.2.2.4.1 Riverine and Lacustrine Features

Riverine features in the proposed and connected project areas and vicinity include several unnamed intermittent drainages. There are five perennial creeks in the proposed and connected project areas: Wildcat, Strawberry, Claremont, San Leandro, and Redwood Creeks. The source of Wildcat Creek is in the southernmost section of the Tilden Regional Park project area. From its source, the creek runs northwest for more than 10 miles, parallels portions of the project area in Tilden and Wildcat Canyon Regional Parks, and eventually drains into San Pablo Bay. Strawberry and Claremont Creeks originate in Strawberry Canyon-PDM and Claremont Canyon Regional Preserve, respectively. These creeks run westward and become channelized and are diverted in culverts underground through the cities of Berkeley and Oakland (Claremont Creek) before draining into San Francisco Bay.

Wildcat Creek is located in Wildcat Canyon Regional Park and Tilden Regional Park. Wildcat Creek flows northwest through the valley between Berkeley Hills and San Pablo Ridge and passes through the city of San Pablo to enter San Pablo Bay. A concrete lined culvert beneath a K-Mart parking lot and a California Department of Transportation (Caltrans) maintained drop structure at Interstate 80 restrict steelhead access to the lower creek, but these barriers may be passable during some flows (Leidy et al. 2005). Two EBRPD-managed dams in the creek's upper watershed form Jewel Lake and Lake Anza and block all upstream migration (Leidy et al. 2005).

The source of San Leandro Creek is in Sibley Volcanic Regional Preserve. From its source, San Leandro Creek flows southeast to the Upper San Leandro Reservoir, runs through Anthony Chabot Regional Park before it becomes Lake Chabot, and finally drains into Arrowhead Marsh at San Leandro Bay. The construction of the Chabot Reservoir created barriers to migration in this creek that have existed since 1874 and include the Upper San Leandro Reservoir and a 4-foot concrete weir, located 0.3 miles upstream from Interstate 80 (Leidy et al. 2005). Redwood

Creek begins in Redwood Regional Park and is a tributary to San Leandro Creek at the Upper San Leandro Reservoir.

Other than Lake Chabot, there are limited lacustrine features in the project vicinity. Two small reservoirs along Wildcat Creek in Tilden Regional Park (Lake Anza and Jewel Lake) are the only pond-like features in the project vicinity. Lake Anza is the larger reservoir and is open for swimming. Four larger reservoirs are within a 5-mile radius of the proposed and connected project areas: Briones Reservoir, San Pablo Reservoir, the Upper San Leandro Reservoir, and Lake Chabot, which is the only major reservoir adjacent to the proposed and connected project areas.

4.2.2.4.2 Wetlands

The 2010 NWI data indicate no evidence of wetland features in the proposed and connected project areas (USFWS 2010a). However, vegetation and hydrology observed during vegetation mapping suggest that potential small wetlands occur in the proposed and connected project areas. These wetlands are mapped as riparian woodland and are associated with Wildcat, Strawberry, Claremont, San Leandro, and Redwood Creeks, as well as other unnamed drainages, seeps, and ponds. No formal jurisdictional delineation of wetlands or waters was completed for this analysis.

Salt marsh habitat is a type of wetland that occurs at Miller/Knox Regional Shoreline. The vegetation management activities associated with the proposed and connected action would occur within upland areas only and would not affect the salt marshes. In addition, there are no defined drainages that could carry sediment off the work areas into the marsh habitats or result in other water quality effects within marsh habitat. For these reasons, the salt marsh wetlands in the Miller/Knox Regional Shoreline are not considered further.

4.2.3 Sensitive Biological Resources

This section describes sensitive biological resources (e.g., special-status species) that are known to occur, or may be present, in the proposed and connected project areas. Special-status species include those federally and/or state listed as threatened, endangered, and/or candidate plant or wildlife species as well as those identified as wildlife species of concern by CDFW and as rare, threatened, or endangered plants by the California Native Plant Society.

4.2.3.1 Methodology for Evaluating the Presence of Sensitive Biological Resources

The evaluation of the sensitive biological resources in the proposed and connected project areas consisted of database searches, a literature review, and field surveys of vegetation communities (see Section 4.2.2.1). The following subsections describe these methods in greater detail.

4.2.3.1.1 Database Searches

Database searches were conducted using the boundaries defined by the following USGS 7.5-minute quadrangles that overlap the proposed and connected project areas, hereafter known

as "project quadrangles": San Quentin, Richmond, Oakland West, Oakland East, Briones Valley, Las Trampas Ridge, San Leandro, and Hayward, as described below:

- An official list of species listed as endangered, threatened, or proposed to be listed as endangered or threatened under the federal ESA (hereafter "federally listed species") under USFWS or NMFS jurisdictions with potential to occur in the nine project quadrangles was developed in coordination with USFWS during preparation of the biological assessment (BA).
- Evolutionarily significant units (ESU) and distinct population segments (DPS) boundaries for federally listed anadromous fish species under NMFS jurisdiction were obtained from the NMFS website and developed in coordination with NMFS during preparation of the BA.
- A list of special-status wildlife and plant species, CDFW-designated sensitive natural communities, and CNPS-listed special-status plant species was obtained from a search of the California Natural Diversity Database for all special-status species occurrences within the project quadrangles (CNDDB 2012).
- Identification of designated or proposed critical habitat under USFWS or NMFS jurisdiction with potential to occur within the proposed or connected project areas was developed in coordination with USFWS and NMFS during preparation of the BA. Recovery plans for all federally listed species under USFWS or NMFS jurisdiction were reviewed. Recovery areas that overlap the proposed and/or connected project areas were identified.
- A list of CNPS sensitive plant species (which includes CNPS lists 1 through 4) that may occur in the project quadrangles was generated using the online inventory database (CNPS 2012).
- A search was conducted of the California Cooperative Anadromous Fish and Habitat Data Program (Calfish) Passage Assessment Database for all impassable stream barriers along streams with connectivity to the proposed and/or connected project areas (Calfish 2011).
- A list of bats designated by the Western Bat Working Group (WBWG) as high or medium priority for conservation in the western region was compiled (WBWG 2011). These species' ranges were compared using the Google Earth program to the proposed and/or connected project areas to identify bat species with potential to occur.

4.2.3.1.2 Literature Review

The literature review for this project consisted of two phases: one prior to the field survey of vegetation communities (see Section 4.2.2.3) and a second, more extensive, literature review of past and current research regarding eucalyptus removal and sensitive biological resources in the proposed and connected project areas. The review included, but was not limited to, the following sources:

- EBRPD EIR (EBRPD 2010)
- EBRPD Wildfire Hazard Reduction and Resource Management Plan (EBRPD 2009b)

- High-quality aerial photographs from 2007 and 2008 (Microsoft Corporation Bing 2010)
- USGS topographic and aquatic features, vegetation maps for Claremont Canyon Regional Preserve and Strawberry Canyon-PDM proposed and connected project areas (FEMA 2006a and 2006b)
- Standard biological references and field guides (e.g., *Jepson Manual* [Hickman 1993], *A Manual of California Vegetation*, first and second editions [Sawyer et al. 2008], *Plants of the San Francisco Bay Area* [Beidleman and Kozloff 2003], *Western Reptiles and Amphibians* [Stebbins 2003], *Sibley Field Guide to Birds of Western North America* [Sibley 2003])
- CDFW's California Wildlife Habitat Relationships (CWHR) System species accounts (CDFG 2005)
- USFWS species accounts
- Scientific and peer reviewed journal articles

4.2.3.2 Special-Status Wildlife Species and Critical Habitat With Potential to Occur

This section describes the special-status wildlife species and their critical habitat with potential to occur in the project areas. A detailed evaluation of federally listed species with the potential to occur in the proposed or connected project areas was conducted for the BA developed in coordination with the USFWS and NMFS.

Table 4.2-3 lists the special-status species and their potential to occur in the proposed and connected project areas. Shaded rows indicate species with a moderate or higher potential to occur. A total of 103 species were identified based on the databases searched, as described in Section 4.2.3.1.1. These include 10 invertebrates, three amphibians, two reptiles, three fish, 24 birds, 12 mammals, and 49 plants.

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
			Invertebrates	
Antioch efferian robberfly	*Efferia antiochi*	None	Known only from Contra Costa and Fresno counties.	No potential. The project areas are outside of the species' known range.
Bay checkerspot butterfly	*Euphydryas editha bayensis*	FT	Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay.	Low potential. The current known distribution is not in vicinity of project areas, but the project areas are within the species' historical range. However, historical occurrences near the project areas are extirpated.
Bridges' coast range shoulderband	*Helminthoglypta nickliniana bridgesi*	None	Inhabits open hillsides of Alameda and Contra Costa counties; tends to colonize under tall grasses and weeds.	High potential. There are two CNDDB occurrences in the project areas and two other occurrences within 5 miles of the project areas. In addition, suitable grassland habitat present in the project areas.

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
Lee's micro-blind harvestman	*Microcina leei*	None	Xeric habitats in the San Francisco Bay region; found beneath sandstone rocks in open oak grassland.	High potential. There is a CNDDB occurrence immediately adjacent to the project areas and one other occurrence within 5 miles of the project areas. In addition, suitable habitats within oak woodland are present in the project areas.
Lum's micro-blind harvestman	*Microcina lumi*	None	Xeric habitats in the San Francisco Bay region; found beneath serpentine rocks in open oak grassland.	High potential. There are suitable habitats within oak woodland present in the project areas.
Tiburon micro-blind harvestman	*Microcina tiburona*	None	Open hilly grassland habitat in areas of serpentine bedrock found on the undersides of serpentine rocks near permanent springs.	No potential. The project areas are outside species known range, which is restricted to Marin County, and suitable serpentine soil habitat is not present in the project areas.
Mimic tryonia (California brackishwater snail)	*Tryonia imitator*	None	Inhabits coastal lagoons estuaries and salt marshes, from Sonoma County, south to San Diego County; found only in permanently submerged areas in a variety of sediment types; able to withstand wide range of salinities.	No potential. Suitable habitat is not present in the project areas.
Monarch butterfly	*Danaus plexippus*	None	Winter roost sites extend along the coast from Northern Mendocina to Baja, California, Mexico. Roosts located in wind-protected tree groves (eucalyptus, Monterey pine, cypress), with nectar and water sources nearby.	High potential. Likely to occur during winter in eucalyptus patches. There are several recent CNDDB occurrences within 5 miles of the project areas, most of which are within 1 mile of the coast.
Sandy beach tiger beetle	*Cicindela hirtcollis gravid*	None	Inhabits areas adjacent to non-brackish water along the coast of California from San Francisco Bay to northern Mexico.	No potential. Suitable coastal habitat not present in project areas.
San Francisco Bay Area leaf-cutter bee	*Trachusa gummifera*	None	Leafcutter bees nest in soft, rotted wood; thick stemmed, pithy plants (e.g., rose); and in similar materials that the bees can easily cut through and excavate. No distribution data available.	Low potential. One CNDDB record from 1957 with no specific location information.
			Amphibians	
California tiger salamander	*Ambystoma californiense*	FT, ST, CSC	Need underground refuges, especially ground squirrel burrows and vernal pools or other seasonal water sources for breeding.	Low potential. Suitable aquatic breeding habitat and upland habitat are not present in the project areas. In addition, the only CNDDB occurrence within 5 miles of the project areas is a historical (1866) occurrence that is extirpated.

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
Foothill yellow-legged frog	*Rana boylii*	CSC	Partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Need at least some cobble-sized substrate for egg-laying.	Low potential. Marginal habitat is present in streams outside the project areas. There is a single CNDDB occurrence from 1997 approximately 1.5 miles east of the project areas; however, surveys within EBRPD land have not detected the species.
California red-legged frog	*Rana draytonii*	FT, CSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby, or emergent riparian vegetation. Requires 11 to 20 weeks of permanent water for larval development. Must have access to estivation habitat.	Present. The species has been documented in Sobrante Ridge Regional Preserve by EBRPD. In addition, there are several CNDDB occurrences within 5 miles of the project areas. Suitable habitat is present within the project areas, both as aquatic/riparian and upland dispersal habitat.
			Reptiles	
Alameda whipsnake	*Masticophis lateralis euryxanthus*	FT, ST	Typically found in chaparral and scrub habitats but would also use adjacent grassland, oak savanna, and woodland habitats.	Present. The species has been documented throughout the East Bay and in EBRPD lands. In addition, there are several CNDDB occurrences within 5 miles of the project areas, and suitable habitat is present in chaparral and coastal scrub habitat in the project areas.
Western pond turtle	*Emys marmorata*	CSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation; needs basking sites and suitable, i.e. sandy banks or grassy open fields, and upland habitat up to 0.3 miles from water for egg-laying.	High potential. Suitable habitat present in streams, lakes, and reservoirs within the vicinity of the project areas. In addition, there are several CNDDB occurrences within 5 miles of the project areas.
			Fish	
Sacramento perch	*Archoplites interruptus*	CSC	Historically found in the sloughs, slow-moving rivers and lakes of the Central Valley. Prefers warm water. Aquatic vegetation is essential for young. Tolerates wide range of physio-chemical water conditions.	No potential. The project areas are outside the native range of the species. The two CNDDB occurrences within 1 mile of the project areas are in Lake Anza and Jewel Lake, both of which are outside the project areas. These occurrences are not natural and may be the result of the lakes being stocked when the reservoirs were built.
Steelhead - Central California Coast DPS	*Oncorhynchus mykiss irideus*	FT	Cool clean water in rivers or streams with suitable gravel substrate for spawning. From Russian River, south to Soquel Creek and to, but not including, Pajaro River. Also San Francisco and San Pablo Bay basins.	Low potential. There is no potential for this DPS to occur in streams within the project areas due to impassable barriers. However, the species is known to occur along a portion of Wildcat Creek and within a short distance of the project areas at San Leandro Creek.

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
Tidewater goby	*Eucyclogobius newberryi*	FE, CSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego to the mouth of the Smith River.	No potential. The project areas are outside the species' known range, and suitable brackish water habitat is not present in the project areas. In addition, the historical occurrences at mouth of Strawberry Creek are now extirpated.
			Birds	
Double-crested cormorant	*Phalacrocorax auritus*	None	Colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state; nests along coast on sequestered islets, usually on ground with sloping surface or in tall trees along lake margins.	Low potential. There are observations of the species in the vicinity of the project areas. In addition, there is suitable foraging habitat present in the reservoirs adjacent to the project areas and one CNDDB occurrence 2 miles northwest of the project areas.
Black-crowned night heron	*Nycticorax nycticorax*	Nesting colonies protected	Colonial nester, usually in trees, occasionally in Tule patches; rookery sites located adjacent to foraging areas, lake margins mud bordered bays, and marshy spots.	High potential. There are observations of the species in the vicinity of the project areas. In addition, there is suitable foraging habitat present in the project areas.
Great blue heron	*Ardea Herodias*	Nesting colonies protected	Colonial nester in tall trees, cliffsides, and sequestered spots on marshes. Rookery sites in close proximity to foraging areas: marshes, lake margins, tide-flats, rivers and streams, wet meadows.	High potential. Suitable nesting habitat is present in the project areas. In addition, there is a single CNDDB occurrence within 1 mile of the project areas in a eucalyptus grove.
Great egret	*Ardea alba*	Nesting colonies protected	Colonial nester in large trees; rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes.	High potential. There are observations of the species in the vicinity of the project areas. In addition, the species is known to nest in eucalyptus, which is present in the project areas.
Snowy egret	*Egretta thula*	Nesting colonies protected	Colonial nester, with nest sites situated in protected beds of dense Tules. Rookery sites situated close to foraging areas; marshes, tidal-flats, streams, wet meadows and borders of lakes.	High potential. There are observations of the species in the vicinity of the project areas, including documented nesting occurrence in the eucalyptus near Lake Chabot, which is adjacent to the project areas. In addition, suitable nesting habitat is present in the project areas.
Cackling (Aleutian Canada) goose	*Branta hutchinsii leucopareia*	FD	Winters on lakes and inland prairies; forages on natural pasture or that cultivated to grain, loafs on lakes, reservoirs, and ponds.	No potential. Suitable habitat is not present in the project areas.
White-tailed kite	*Elanus leucurus*	None	Rolling foothills and valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodlands; open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	High potential. There are observations of the species in the vicinity of the project areas. In addition, suitable habitat is present in the project areas, and there are three CNDDB occurrences within 5 miles of the project areas.

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
Bald eagle	*Haliaeetus leucocephalus*	BGEPA, FD, SE	Requires large bodies of water, or free flowing rivers with abundant fish and adjacent snags or other perches.	Low potential. Suitable foraging habitat is present adjacent to the project areas in lakes and reservoirs but not within it. Suitable nesting habitat is absent from the project areas. There are observations of the species in the vicinity of the project areas as well as a CNDDB occurrence approximately 2 miles east of the project areas.
Golden eagle	*Aquila chrysaetos*	BGEPA	Rolling foothills, mountain areas, sage-juniper flats, and desert. Cliff-walled canyons provide nesting habitat in most parts of range; also, large trees in open areas.	Moderate potential. There are observations of the species in the vicinity of the project areas. In addition, there is suitable foothill habitat present in the project areas and a single CNDDB occurrence within 0.5 mile of the project areas.
Cooper's hawk	*Accipiter cooperii*	None	Woodland, chiefly of open, interrupted, or marginal type. Nest sites mainly in riparian growths of deciduous trees, as in canyon bottoms on river flood-plains; also, live oaks.	High potential. The species has been documented in the project vicinity. In addition, suitable woodland habitat is present in the project area, and there are three CNDDB occurrences within 5 miles of the project areas.
Northern harrier	*Circus cyaneus*	CSC	Coastal salt and fresh-water marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain springs. Nests on ground in shrubby vegetation, usually at marsh edge.	Low potential. Although the species is known to occur in the vicinity of the project areas, suitable grassland habitat is limited in the project areas.
California black rail	*Laterallus jamaicensis coturniculus*	ST	Inhabits freshwater marshes, wet meadows, and shallow margins of saltwater marshes bordering larger bays; needs water depths of approximately 1 inch that does not fluctuate during the year and dense vegetation for nesting.	No potential. Suitable marsh habitat is not present in the project areas.
California clapper rail	*Rallus longirostris obsoletus*	FE, SE	Saltwater and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay; associated with abundant growths of pickleweed but feeds away from cover on invertebrates from mud-bottomed sloughs.	No potential. Suitable pickleweed-dominated marsh habitat is not present in the project areas.
Western snowy plover	*Chardrius alexandrinus nivosus*	FT, CSC	Sandy beaches, salt ponds levees, and shores of large alkali lakes.	No potential. Suitable coastal habitat is not present in the project areas.
California least tern	*Sternula antillarum browni*	FE, SE	Nests along the coast from San Francisco Bay, south to northern Baja California; colonial breeder on bare or sparsely vegetated flat substrates. Sand beaches, alkali flats, landfills, or paved areas.	No potential. Suitable coastal habitat is not present in the project areas.

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
Caspian tern	*Hydroprogne caspia*	None	Nests on sandy or gravely beaches and shell banks in small colonies inland and along the coast; inland freshwater lakes and marshes, also brackish or salt waters of estuaries and bays.	Low potential. Suitable nearshore habitat is not present in the project areas, although suitable foraging habitat may be present in the project areas. In addition, there are observations of the species in vicinity of the project areas and a single CNDDB occurrence within 2 miles of the project areas.
Black skimmer	*Rynchops niger*	CSC	Nests on gravel bars, low islets, and sandy beaches, in un-vegetated sites; nesting colonies usually less than 200 pairs.	Low potential. Suitable nearshore habitat is not present in the project areas although suitable foraging habitat may be present in the project areas.
Burrowing owl	*Athene cunicularia*	CSC	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation.	Low potential. A limited amount of open grassland area is present in the project areas. However, there are three CNDDB occurrences within 5 miles of the project areas, and the project areas are within the species' known range.
Short-eared owl	*Asio flammeus*	CSC	Found in fresh and salt swamp lands and lowland meadows and irrigated alfalfa fields. Tule patches/tall grass needed for nesting/day time seclusion. Nests on dry ground, in depressions concealed in vegetation.	Low potential. A limited amount of open grassland area is present in the project areas, and there is a single CNDDB occurrence approximately 2 miles north of the project areas.
Yellow warbler	*Dendroica petechia brewsteri*	CSC	Riparian plant associations, prefers willows, cottonwoods, aspens, sycamores and alders for nesting and foraging; also nests in montane shrubbery in open conifer forests.	High potential. The species has been documented nesting within some EBRPD lands. Suitable riparian habitat is present, although limited, in the project areas.
Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*	CSC	Resident of the San Francisco Bay region, in fresh and salt water marshes; requires thick continuous cover down to water surface for foraging, tall grasses, Tule patches and willows for nesting.	No potential. Suitable marsh habitat is not present in the project areas.
Alameda song sparrow	*Melospiza melodia pusillula*	CSC	Resident of salt marshes bordering south arm of San Francisco Bay. Inhabits *Salicornia* marshes, nests in *Grindelia* bushes that are high enough to use to escape tides and in *Salicornia.*	Low potential. Foraging habitat is present in the Miller/Knox Regional Shoreline portion of the project areas. Although there are several CNDDB occurrences within 5 miles along the coast, only one historical (1940) occurrence is within the project areas at Miller/Knox Regional Shoreline.
San Pablo song sparrow	*Melospiza melodia samuelis*	CSC	Resident of salt marshes along the north side of San Francisco and San Pablo Bays; inhabits tidal sloughs in the *Salicornia* marshes. Nests in *Grindelia* bordering slough channels.	Low potential. Marginal foraging habitat may be present in the project areas. There are several CNDDB occurrences within 5 miles of the project areas along the coast, including one in Sobrante Ridge Regional Preserve.

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
Suisun song sparrow	*Melospiza melodia maxillaries*	CSC	Resident of brackish water marshes surrounding Suisun Bay; inhabits cattails, tules and other sedges, along with *Salicornia*. Also known to frequent tangles bordering sloughs.	No potential. The project areas are outside the species' known range, and suitable marsh habitat is not present in the project areas.
			Mammals	
Alameda Island mole	*Scapanus latimanus parvus*	CSC	Only known from Alameda Island; found in a variety of habitats especially annual and perennial grasslands; prefers moist, friable soils and avoids flooded soils.	No potential. The project areas are outside the species' known range.
Salt-marsh wandering shrew	*Sorex vagrans halicoetes*	CSC	Salt marshes of the south arm of San Francisco Bay; medium high marsh, 6 to 8 feet above sea-level where abundant drift wood is scattered among *Salicornia.*	No potential. Suitable marsh habitat is not present in the project areas.
Salt-marsh harvest mouse	*Reithrodontomys raviventris*	FE, SE	Only in saline emergent wetlands of San Francisco Bay and its tributaries; pickleweed is primary habitat. Does not burrow or build loosely organized nests. Requires higher areas to escape floods.	No potential. Suitable pickleweed habitat is not present in the project areas.
San Pablo vole	*Microtus californicus sanpabloensis*	CSC	Salt marshes of San Pablo Creek, on the south shore of San Pablo Bat; constructs burrow in soft soil; feeds on grasses, sedges, and herbs; and forms a network of runways leading from the burrow.	No potential. The project areas are outside the species' known range.
Big free-tailed bat	*Nyctinomops macrotis*	CSC	Low-lying areas in southern California; needs high cliffs or rocky outcrops for roosting sites and feeds principally on large moths.	No potential. The project areas are outside the species' known range.
Hoary bat	*Lasiurus cinereus*	None	Prefers open habitats or habitat mosaics, with access to trees for cover and open areas or habitat edges for feeding.	High potential. Suitable habitat is present in the project areas. In addition, there are four historical CNDDB occurrences (from 1920 to 1972) either within or adjacent to the project areas.
Pallid bat	*Antrozous pallidus*	CSC	Deserts, grasslands, shrublands, woodlands, and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	Low potential. Suitable habitat is present in the project areas. There are several CNDDB occurrences within 5 miles although most are historical (CNDDB 2012).

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
Silver-haired bat	*Lasionycteris noctivagans*	None	Primarily a coastal and montane forest dweller, feeding over streams, ponds, and open brushy areas; roosts in hollow trees, beneath exfoliating bark, in abandoned woodpecker holes, and rarely under rocks. Needs drinking water.	Low potential. Suitable habitat is present in and adjacent to the project areas. However, recent occurrences of the species have not been documented in the project areas or vicinity. The two CNDDB occurrences within 5 miles of the project areas are from 1920 and 1982.
Western mastiff bat	*Eumops perotis californicus*	CSC	Many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, chaparral, etc. Roosts in crevices in cliff faces, high buildings, trees, and tunnels.	Low potential. Very marginal foraging habitat may be present adjacent to the project areas, but there is no suitable roosting habitat in the project areas. There is one historical CNDDB occurrence (1899) approximately 3 miles south of the project areas.
Berkeley kangaroo rat	*Dipodomys heermanni berkeleyensis*	None	Open grassy hilltops and open spaces in chaparral and blue oak/digger pine woodlands.	No potential. There have been no occurrences of the species in the area for several years, and the species is believed to be extirpated (EBRPD 2009). All four CNDDB occurrences overlapping with and adjacent to the project areas are historical (1919-1938).
San Francisco dusky woodrat	*Neotoma fuscipes annectens*	CSC	Forest habitats of moderate canopy and moderate to dense understory. May prefer chaparral and redwood habitats.	Moderate potential. Suitable habitat is present in the project areas, and a there is a recent (2006) CNDDB occurrence near the project areas.
American badger	*Taxidea taxus*	CSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	Low potential. Limited marginal habitat is present in the project areas. There are two historical CNDDB occurrences (from 1925 and 1930) in and near the project areas.
			Plants	
Adobe sanicle	*Sanicula maritime*	SR, CNPS List 1B.1	Meadows and seeps, valley and foothill grassland, chaparral, coastal prairie; moist clay or ultramafic soils, 30-240M.	No potential. The species is believed to be extirpated from the East Bay. The only CNDDB occurrence within 5 miles is 4 miles west and extirpated.
Alkali milk-vetch	*Astragalus tener* var. *tener*	CNPS List 1B.1	Alkali playa, valley and foothill grassland, vernal pools, low ground, alkali flats, and flooded land in annual grassland or in playas or vernal pools.	No potential. The closest presumed extant population is in Albrae, California, which is more than 15 miles south of the project areas, and suitable vernal pool habitat is not present in the project areas.
Beach layia	*Layia carnosa*	FE, SE, CNPS List 1B.1	Coastal dunes, hugely reduced in range along California's North coast dunes; on sparsely vegetated, semi-stabilized dunes, usually behind foredunes, 0 to 75 meters (M)	No potential. Suitable coastal dune habitat is not present in the project areas, and there are no CNDDB occurrences within 5 miles.

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
Bent-flowered fiddleneck	*Amsinckia lunaris*	CNPS List 1B.2	Cismontane woodland, valley and foothill grassland.	High potential. Suitable grassland habitat is present in the project areas. There is one CNDDB occurrence in the immediate vicinity of the project areas and multiple CNDDB occurrences within 5 miles.
Big-scale balsam root	*Balsamorhiza macrolepis* var. *macrolepis*	CNPS List 1B.2	Valley and foothill grassland, cismontane woodland.	High potential. Suitable grassland and woodland habitat present in the project areas. There are known occurrences in Anthony Chabot Regional Park as well as two CNDDB occurrences located at Fairmont Ridge approximately 2 miles west of the project areas.
Blue coast gilia	*Gilia capitata* ssp. *Chamissonis*	CNPS List 1B.1	Coastal dunes and coastal scrub.	No potential. Suitable habitat is not present in the project areas.
Bristly sedge	*Carex comosa*	CNPS List 2.1	Marshes and swamps. Lake margins, wet places; site below sea level is on a delta island, -5 to 1005M.	No potential. Suitable habitat is not present in the project areas.
California sea blite	*Suaeda californica*	FE, CNPS List 1B.1	Marshes and swamps; margins of coastal salt marshes, 0 to 5M.	No potential. Suitable habitat is not present in the project areas, and the project areas are outside the elevation range of the species.
Northern California black walnut	*Juglans hindsii*	CNPS List 1B.1	Riparian forest, riparian woodland, few extant native stands remain; wildly naturalized. Prefers deep alluvial soil associated with a creek or stream, 0 to 395M.	High potential. Small areas with suitable riparian woodland habitat are present in the project areas. There are known occurrences in Anthony Chabot Regional Park.
Carquinez goldenbush	*Isocoma arguta*	CNPS List 1B.1	Valley and foothill grassland; alkaline soils, flats lower hills on low benches near drainages and on tops and sides of mounds in swale habitat, 1 to 20M.	Low potential. Suitable habitat is present within the project areas. However, the only CNDDB occurrence is north of the project areas.
Choris' popcorn-flower	*Plagiobothrys chorisianus* var. *chorisianus*	CNPS List 1B.2	Chaparral, coastal scrub, coastal prairie; mesic sites, 15 to 100M.	No potential. The only known remaining populations are in San Mateo and Santa Cruz counties.
Coastal bluff morning glory	*Calystegia purpurata* ssp. *Saxicola*	CNPS List 1B.2	Coastal dunes, coastal scrub.	No potential. The closest known presumed extant occurrence (Sheep Island) is from a historical 1893 collection. In addition, suitable habitat is not present in the project areas.
Coastal triquetrella	*Triquetrella californica*	CNPS List 1B.2	Coastal bluff scrub, coastal scrub valley, and foothill grasslands; grows from within 30M from the coast in coastal scrub, grasslands and in open gravels on roadsides, hillsides and rocky slopes.	No potential. The project areas are outside the species' known range, and the only two occurrences in the East Bay are presumed extirpated.
Congdon's tarplant	*Centromadia parryi* ssp. *Congdonii*	CNPS List 1B.2	Valley and foothill grassland.	Low potential. Marginal grassland habitat is present in the project areas. There are three CNDDB occurrences located within 5 miles; however, only one is presumed extant and is located over 4.5 miles west of the project areas.

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
Contra Costa goldfields	*Lasthenia conjugens*	FE, CNPS List 1B.1	Valley and foothill grassland, vernal pools, cismontane woodland. Extirpated from most of its range; extremely endangered.	No potential. Suitable vernal pool habitat is not present in the project areas. The species is extirpated from most of its range. The only CNDDB occurrence within 5 miles of the project areas is approximately 4 miles north of the project areas.
Delta tule pea	*Lathyrus jepsonii* var. *jepsonii*	CNPS List 1B.2	Freshwater and brackish marshes; often found with *Typha, Aster lentus, Rosa california, Juncus* spp., *Scirpus*, etc., and usually on marsh and slough edges.	No potential. Suitable marsh and swamp habitat is not present in the project areas, and there are no CNDDB occurrences within 5 miles.
Diablo helianthella	*Helianthella castanea*	CNPS List 1B.2	Broad-leaved upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley and foothill grassland; usually in chaparral/oak woodlans interface in rocky azonal soils and often in partial shade, 25 to 1150M.	High potential. Suitable habitat is present in the project areas. There are known occurrences in Sobrante Ridge Regional Preserve, Tilden Regional Park, and Lake Chabot Regional Park. In addition, there are several CNDDB occurrences in or near the project areas.
Fragrant fritillary	*Fritillaria liliacea*	CNPS List 1B.2	Coastal scrub, valley and foothill grassland, coastal prairie.	High potential. Suitable woodland and grassland habitat is present in the project areas. There are known occurrences in Anthony Chabot Regional Park and near Wildcat Canyon Regional Park. In addition, there are eight CNDDB occurrences in or near the project areas although several are possibly extirpated.
Franciscan thistle	*Cirsium andrewsii*	CNPS List 1B.2	Coastal bluff scrub, broad-leaved upland forest ,coastal scrub; sometimes serpentine seeps, 0 to 135M.	Low potential. Suitable coastal habitat is present in limited portions of the project areas, such as Miller/Knox Regional Shoreline. There is one recent CNDDB occurrence (2006) approximately 1.5 miles east of the project areas.
Hairless popcorn-flower	*Plagiobothrys glaber*	CNPS List 1A	Meadows and seeps, marshes and swamps.	No potential. Suitable habitat is not present in the project areas. There is a historical CNDDB occurrence (1890) located 4 miles south of the project areas that is likely extirpated.
Kellogg's horkelia	*Horkelia cuneata* var. *sericea*	CNPS List 1B.1	Closed-cone coniferous forest, coastal scrub chaparral; old dunes, coastal sandhills openings. 10 to 200M.	No potential. Suitable coastal dune habitat is not present in the project areas. In addition, there are no CNDDB occurrences within 5 miles of the project areas.
Loma Prieta hoita	*Hoita strobilina*	CNPS List 1B.1	Chaparral, cismontane woodland, riparian woodland.	Low potential. Marginal habitat is present in the project areas. There are two CNDDB occurrences known within 1 mile of the project areas, but the species is believed to have been extirpated from the East Bay.

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
Marin western flax	*Hesperolinon congestum*	FT, ST, CNPS List 1B.1	Chaparral, valley and foothill grassland; in serpentine barrens, and in serpentine grassland and chaparral, 30 to 365M.	No potential. The project areas are outside the species' known range, which is restricted to Marin, San Francisco, and San Mateo counties.
Most beautiful jewel-flower	*Streptanthus albidus* ssp. *Peramoenus*	CNPS List 1B.2	Chaparral, valley and foothill grassland, cismontane woodland.	High potential. Suitable chaparral habitat is present in the project areas. There are several recent CNDDB occurrences near the project areas.
Mt. Diablo fairy-lantern	*Calochortus pulchellus*	CNPS List 1B.2	Chaparral,valley and foothill grassland and cismontane and Riparian woodlands.	Low potential. Marginal habitat is present in the project areas. There is one CNDDB occurrence approximately 3 miles east of the project areas on Ramage Peak.
Oregon meconella	*Meconella oregano*	CNPS List 1B.1	Coastal prairie, coastal scrub; open moist places, 250 to 500M.	High potential. Suitable coastal scrub habitat is present in the project areas. There are four CNDDB occurrences approximately 1 mile east of the project areas. There is also an occurrence near Sibley Volcanic Regional Preserve.
Oval-leaved viburnum	*Viburnum ellipticum*	CNPS List 2.3	Chaparral, cismontane woodland, lower, montane coniferous forest, 215 to 1400M.	Moderate potential. Suitable habitat exists in the project areas.
Pallid manzanita	*Arctostaphylos pallid*	FT, SE, CNPS List 1B.1	Broad-leafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, coastal scrub.	Present. Suitable chaparral habitat is present in the project areas. There are several documented and observed occurrences within the project areas, including occurrences in Sobrante Ridge and Huckleberry Botanic Regional Preserves.
Point Reyes bird's-beak	*Chloropyron matirum* ssp. *Palustre*	CNPS List 1B.2	Coastal salt marsh; usually in coastal salt marsh with Salicornia, *Distichlis, Jaumea, Spartina*, etc. 0 to 15M.	No potential. Suitable coastal marsh and swamp habitat is not present in the project areas. The nearest CNDDB occurrence is approximately 4 miles west of the project areas and separated by San Francisco Bay.
Presidio clarkia	*Clarkia franciscana*	FE, SE, CNPS List 1B.1	Coastal scrub, valley and foothill grassland.	High potential. A 0.07-acre area within Redwood Regional Park contains known occurrences of Presidio clarkia based on mapping by EBRPD. There is also a managed population adjacent to the project areas at Skyline Serpentine Prairie in Redwood Regional Park. Potential habitat of serpentine bunchgrass is located in the same area.
Robust spineflower	*Chorizanthe robusta* var. *robusta*	FE, CNPS List 1B.1	Cismontane woodland, coastal dunes, coastal scrub.	No potential. The species is believed to be extirpated from the East Bay. The only CNDDB occurrence is historical (1894) and thought to be extirpated.
Rose leptosiphon	*Leptosiphon rosaceus*	CNPS List 1B.1	Coastal bluff scrub, 0 to 100M.	No potential. Suitable habitat is not present in the project areas.

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
Round-leaved filaree	*California macrophylla*	CNPS List 1B.1	Cismontane woodland, valley and foothill grassland.	Low potential. Marginal grassland habitat is present in the project areas. There are three historical CNDDB occurrences (from 1888 to1931) within 5 miles of the project areas although these occurrences are thought to be extirpated.
Saline clover	*Trifolium hydrophilum*	CNPS List 1B.2	Marshes and swamps, valley and foothill grassland, vernal pools.	No potential. The species is believed to be extirpated from the East Bay, and suitable habitat is not present in the project areas.
San Francisco Bay spineflower	*Chorizanthe cusipata* var. *cuspidate*	CNPS List 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie and coastal scrub. Closely related to *C. pungens.* Sandy soil on terraces and slopes, 5 to 550M.	No potential. The species is believed to be extirpated from the East Bay The only CNDDB occurrence within 5 miles of the project areas is extirpated. The closest documented occurrences are in Marin and San Francisco Counties.
San Francisco popcorn-flower	*Plagiobothrys diffuses*	SE, CNPS List 1B.1	Valley and foothill grassland, coastal prairie' historically from grassy slopes with marine influence, 60 to 485M.	High potential. Suitable habitat is present in the project areas. There is one recent CNDDB occurrence (1997) less than 1 mile from the project areas at the intersection of Redwood Road and Skyline Boulevard.
Santa Clara red ribbons	*Clarkia concinna* ssp*. Automixa*	CNPS List 4.3	Cismontane woodland, chaparral; on slopes and near drainages, 90 to 970M.	Low potential. Historic occurrence noted by CNDDB in Oakland Hills.
Santa Cruz tarplant	*Holocarpha macradenia*	FT, SE CNPS List 1B.1	Coastal prairie, valley and foothill grassland; light sandy soil or sandy clay, often with non-natives, 10 to 260M.	Present as experimentally planted populations in Wildcat Canyon Regional Park and Sobrante Ridge Regional Preserve, outside the project areas. All natural populations in the vicinity of the project areas are believed to be extirpated.
Showy rancheria clover	*Trifolium amoenum*	FE, CNPS List 1B.1	Valley and foothill grassland, coastal bluff scrub; sometimes on serpentine soil, open sunny sites, swales. Most recently sighted on roadside and eroding cliff face, 5 to 560M.	No potential. The project areas are outside the species' known range.
Slender-leaved pondweed	*Stuckenia filiformis*	CNPS List 2.2	Marshes and swamps; shallow, clear water of lakes and drainage channels, 15 to 2310M.	No potential. Suitable habitat is not present in the project areas.
Suisun Marsh aster	*Symphyotrichum lentum*	CNPS List 1B.2	Marshes and swamps (bracksish and freshwater); most often seen along sloughs with *Phragmites, Scirpus*, blackerry, *Typha,* etc., 0 to 3M.	No potential. Suitable habitat is not present in the project areas, and the project areas are outside the elevation range of the species.

Table 4.2-3. Special-Status Species and Potential to Occur in the Proposed and Connected Project Areas

Common Name	Scientific Name	Status	Habitat Requirements	Potential to Occur
Tiburon buckwheat	*Eriogonum luteolum* var. *caninum*	CNPS List 1B.2	Chaparral, valley and foothill grassland, cismontane woodland, coastal prairie; serpentine soils, sandy to gravelly sites, 0 to 700M.	High potential. Suitable chaparral and grassland habitat is present in the project areas. There are extant CNDDB occurrences within 1 mile of the project areas. In addition, the species is known to occur in the Skyline Serpentine Prairie of Redwood Regional Park near the project areas.
Tiburon jewel-flower	*Streptanthus glandulosus* ssp. *Niger*	FE, SE, CNPS List 1B.1	Valley and foothill grassland; shallow, rocky serpentine slopes, 30 to 150M.	No potential. The project areas are outside the species' known range.
Tiburon mariposa-lilly	*Calochortus tiburonensis*	FT, ST, CNPS List 1B.1	Valley and foothill grassland; on open, rocky, slopes in serpentine grassland 50 to 150M.	No potential. The project areas are outside the species' known range, which is restricted to Marin County, and suitable serpentine soil habitat is not present in the project areas.
Tiburon paintbrush	*Castilleja affinis* ssp. *Neglecta*	FE, ST, CNPS List 1B.2	Valley and foothill grassland on rocky and serpentine sites.	No potential. The project areas are outside the species' known range, which is restricted to Marin, Napa, and Santa Clara counties.
Western leatherwood	*Dirca occidentalis*	CNPS List 1B.1	Broad-leaved upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, Northern coast coniferous forest, riparian forest, riparian woodland on bushy slopes, mesic sites, mostly in mixed evergreen and foothill woodland communities, 30 to 550M.	High potential. Suitable chaparral and forest habitat is present in the project areas. There are multiple extant CNDDB occurrences in or near the project areas. The species is known to occur in Wildcat Canyon, Tilden, Redwood, and Lake Chabot Regional Parks and Claremont Canyon, Sibley Volcanic, and Huckleberry Botanic Regional Preserves.
White-rayed pentachaeta	*Pentachaeta bellidiflora*	FE, SE, CNPS List 1B.1	Valley and foothill grassland; open dry rocky slopes and grassy areas, often on soils derived from serpentine bedrock, 35 to 620M.	No potential. The project areas are outside the species' known range.
White seaside tarplant	*Hemizonia congesta* ssp. *Congesta*	CNPS List 1B.2	Coastal scrub, valley and foothill grassland, grassy valleys and hills; often in fallow fields, 25 to 200M	Low potential. Suitable habitat is present in the project areas but known only from historic occurrences.
Woodland woollythreads	*Monolopia gracilens*	CNPS List 1B.2	Chaparral, valley and foothill grasslands (serpentine), cismontane woodland, broad-leafed upland forests, north coast coniferous forest.	Low potential. Marginal habitat, lacking serpentine soil, is present in the project areas, and there is a single CNDDB occurrence within 5 miles of the project areas.

Sources: CNDDB (2012) search of the following USGS 7.5-Minute quadrangles:San Quentin, Richmond, Oakland West, Oakland East, Briones Valley, Las Trampas Ridge, San Leandro, and Hayward; *USFWS Sacramento Office species list generator (USFWS 2012), and the Calfish database (Calfish 2011).*

Key:

BGEPA = Bald and Golden Eagle Protection Act

CNPS = California Native Plant Society (CNPS) List 1A: Plants presumed extinct in California

List 1A: Plants presumed extinct in California

List 1B.1: Plants rare, threatened, or endangered in California and elsewhere; seriously threatened in California

List 1B.2: Plants rare, threatened, or endangered in California and elsewhere, fairly threatened in California

List 2.1: Plants rare, threatened, or endangered in California, but more common elsewhere; seriously threatened in California

List 2.2: Plants rare, threatened, or endangered in California, but more common elsewhere; fairly threatened in California

List 2.3: Plants rare, threatened, or endangered in California, but more common elsewhere; not very threatened in California
List 4.2: Plants of limited distribution; fairly threatened in California
List 4.3: Plants of limited distribution; not very threatened in California
CSC = California Species of Concern
FD = federal delisted
FE = federal endangered
FT = federal threatened
None = Not officially listed but considered rare to varying extent
SE = state endangered
SR = state rare
ST = state threatened

The potential for each species to occur within the proposed and connected project areas was determined based on habitat requirements and occurrences cited by CNDDB and previous surveys (EBRPD 2009b). Based on that analysis, 31 species are considered to be present or have high or moderate potential to occur and include four invertebrates, one amphibian, two reptiles, eight birds, two mammals, and 14 plants.

4.2.3.2.1 Federally Listed Wildlife Species

The federally listed species with potential to occur in the project areas are the California red-legged frog (CRLF) (*Rana draytonii*), Alameda whipsnake (AWS) (*Masticophis lateralis euryxanthus*), and the Central California Coast (CCC) DPS of steelhead (*Oncorhynchus mykiss*). These species are described in the following sections.

Other federally listed wildlife species that appear on the CNDDB list, as shown in Table 4.2-3, include the Bay checkerspot butterfly (*Euphydryas editha bayensis*) and the Callippe silverspot butterfly (*Speyeria callippe callippe*). These species were determined to have low or no potential to occur in the proposed and connected project areas and are not discussed further.

California Red-Legged Frog

The CRLF is listed as threatened under the ESA. Historically, the species inhabited 46 counties in central and coastal California from southern Shasta County to the Mexico border (USFWS 2002b). This species has been extirpated from 24 of these counties and is now limited primarily to small coastal drainages between Santa Barbara and areas just north of San Francisco (Jennings and Hayes 1994). The largest extent of currently occupied habitat is in Monterey, San Luis Obispo, and Santa Barbara Counties (USFWS 2002b). The continuing population decline of this species is attributed to loss of freshwater habitat and the introduction of non-native predatory fish species and bullfrogs (USFWS 2002b).

Critical habitat and recovery plans. Critical habitat for the CRLF was designated in 2006 (71 FR 19244–19346) and revised in 2010 (75 FR 12816–12959). The proposed and connected project areas do not overlap any designated critical habitat units; however, Area CCS-1 (Berkeley Hills) is less than 2 miles east of the Sobrante Ridge Regional Preserve portion of the proposed and connected project areas, and Area ALA-1A (Dublin Canyon) and Area ALA-1B (Cook Canyon) are 4 miles southeast of the Anthony Chabot Regional Park portions of the proposed and connected project areas. A recovery plan for the species was finalized in May of 2002 (USFWS 2002b). The recovery plan identifies eight recovery units and 35 core areas where

recovery actions should be focused. The proposed and connected project areas fall in Recovery Area 4 (South and East San Francisco Bay Recovery Area) but do not overlap any of the core areas. Because there is no designated critical habitat within the proposed and connected project areas, CRLF critical habitat is not included in the impacts analysis.

Life history. Typical habitat for this species is a combination of dense, shrubby, or emergent riparian vegetation closely associated with deep water (more than 2.3 feet deep) and the absence of predatory fish and bullfrogs. Upland habitats with dense vegetation may be important sheltering habitat during the winter. This species has been found up to 100 feet from water in adjacent riparian vegetation. This species has also been known to disperse more than 2 miles from nonbreeding habitat to locate breeding habitat (Bulger et al. 2003). However, typically only a small percentage of the CRLF adult population at a given location migrate to and from breeding sites annually, leaving most resident at their current breeding locations (Bulger et al. 2003).

The CRLF breeds from late November to late April, and females deposit egg masses of 2,000 to 6,000 eggs on emergent vegetation (Jennings and Hayes 1994). Embryos hatch within 2 weeks and take 4 to 5 months to metamorphose. Adult frogs are typically nocturnal and prey on invertebrates, small frog species, and small mammals (USFWS 2002b).

Potential to occur. Based on CNDDB, there are no known occurrences of CRLF within the action area; however, CRLF are known to occur near portions of the proposed and connected project areas and have the potential to occur where suitable habitat occurs. There are four documented CNDDB occurrences within 2 miles of the proposed and connected project areas, a distance that the species has been documented dispersing to locate breeding habitat (USFWS 2002b). The following four occurrences are within 2 miles of the action area:

- Sibley Volcanic Regional Preserve, RTA SR002B; one CNDDB occurrence along a stream approximately 250 feet from the project areas
- Kennedy Grove, RTA KG002; one CNDDB occurrence along a stream approximately 650 feet from the project areas
- Sobrante Ridge Regional Preserve; one CNDDB occurrence along a stream approximately 4,400 feet from the project areas
- Tilden Regional Park; one CNDDB occurrence at a pond approximately 6,000 feet away from the project areas

All of these occurrences are presumed to be extant (currently present), and most were recorded within the last 10 years. The EBRPD has conducted surveys for CRLFs in aquatic habitats in its parks and reports occurrences of the species in Sobrante Ridge Regional Preserve (Bobzien and DiDonato 2007).

CRLF habitat in the proposed and connected project areas includes both aquatic/riparian habitat and upland dispersal habitat. Since there are no known breeding occurrences within the action area, aquatic/riparian habitat is considered non-breeding habitat.

The USGS National Hydrography Dataset (NHD) line surface hydrology shapefile was used to identify streams in the project areas. The NHD is a comprehensive set of digital spatial data that contains information about naturally occurring and constructed bodies of water, natural and artificial paths of water flows, and related hydrographic entities. A 50-foot buffer along the NHD line was used to identify the spatial extent of potential CRLF non-breeding aquatic/riparian areas within the proposed and connected project areas. A 500-foot buffer along the NHD line was used to identify the spatial extent of upland dispersal habitat since CRLFs are unlikely to be in areas more than 500 feet from aquatic habitat unless they are dispersing between breeding areas on rainy days. Since major ground disturbing work and use of heavy equipment would not occur during the wet season or on rainy days (unless exclusion fencing up prior to the start of the wet season), the 500-foot buffer was considered appropriate for determining dispersal areas for the CRLF.

Alameda whipsnake

The AWS is listed as threatened under the ESA. This species historically inhabited Alameda and Contra Costa Counties and potentially western San Joaquin and northern Santa Clara Counties (USFWS 2002a). Urban development and associated highway and road development has fragmented the originally continuous range of this species. According to the USFWS, the primary cause of the decline of the AWS is the loss of habitat from human activities, and the alteration of suitable habitat (70 CFR §§ 60608-60655).

Critical habitat and recovery plans. Critical habitat was designated for the AWS in 2006 (71 CFR § 58175). The project areas overlap Area 1 (Tilden-Briones), Area 2 (Oakland-Las Trampas), and Area 6 (Caldecott Tunnel Corridor). All areas finalized as designated critical habitat for the AWS are considered occupied, in the subspecies' historical geographic range, and contain sufficient habitat to support at least one life history function as defined in the critical habitat designation (71 CFR § 58191). The species is included in the *Draft Recovery Plan for Chaparral and Scrub Community Species East of San Francisco*, published by the USFWS in 2002 (USFWS 2002a). An updated species-specific recovery plan is currently in draft form and not publically available. The recovery units identified in the draft recovery plan cover the designated critical habitat units described above plus additional areas.

An analysis was conducted to identify the presence of the three designated primary constituent elements (PCEs) and designated critical habitat for AWS in the project areas. PCEs for the AWS are defined in 50 CFR Part 17: Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the AWS (October, 2006) as follows:

- PCE 1 = >0.5 acre of coastal scrub, coyote brush scrub, and/or chaparral that provides shelter from predators, temperature regulation, prey-viewing opportunities, and nesting habitat and substrate
- PCE 2 = oak-bay woodland, riparian woodland or grassland adjacent to PCE 1 that provides foraging and dispersal habitat
- PCE 3 = lands with rocky outcrops, talus, and burrows within or adjacent to PCE 1 and PCE 2 that provide retreats (shelter), hibernacula, foraging, and dispersal habitat and provide additional prey population support functions

The presence of rock-bearing soils in the proposed and connected project areas was used to identify the highest "potential" for the presence of PCE 3 or rocky outcrops. Information obtained from EBRPD field assessments identified rocky outcrops in EBRPD parks. Information on UCB and City of Oakland parcels indicates they are limited to "potential" PCE 3 based on presence of rock-bearing soils. The results of PCE analysis of AWS critical habitat in the proposed and connected project areas indicate that of the 22 parks/parcels evaluated, 15 contain existing AWS critical habitat, including Anthony Chabot, Claremont Canyon (EBRPD), Claremont Canyon (Stonewall), Huckleberry, Kennedy Grove, Redwood, Sibley Island, Sibley Volcanic Regional Preserve, Tilden, Tilden-Grizzly Peak, Wildcat Canyon, North Hills-Skyline, Strawberry Canyon, Claremont Canyon (UCB), and Frowning Ridge. (Please note that the parks/parcels correspond to the larger park names, and there may be more than one polygon where vegetation management actions would take place within each park/parcel).

Life history. The AWS is associated primarily with coastal scrub and northern maritime chaparral communities but may occur in other California Coast Range plant communities, including annual grasslands, open woodlands, rocky slopes, and along open streams near coastal scrub and northern maritime chaparral (70 CFR §§ 60608-60655). Recent telemetry data indicate that although home ranges of AWS are centered on coastal scrub communities, they use a variety of adjacent habitats (70 CFR §§ 60608-60655). Rocky outcrops are also an important feature of AWS habitat because they provide retreat opportunities for whipsnakes and promote western fence lizard (*Sceloporus occidentalis*) populations, which are the species' primary prey (70 CFR §§ 60608-60655). AWS also prey on skinks, frogs, snakes, and birds that may use rock outcrop features.

AWS generally retreat in November into a hibernacula (shelter used during the snake's dormancy period) and emerge in March (70 CFR §§ 60608-60655). Courtship and mating occur from late March through mid-June. During the courtship period, males move around throughout their home ranges while females appear to remain at or near their hibernaculum where mating occurs.

The current range of the AWS is confined to the following five populations in Alameda and Contra Costa Counties, with little or no genetic flow between them (70 CFR §§ 60608–60655): Sobrante Ridge, Oakland Hills, Hayward Hills, Mount Diablo vicinity and the Black Hills, and Wauhab Ridge.

Potential to occur. The AWS is known to occur in portions of the proposed and connected project areas and has the potential to occur in other parts of the proposed and connected project areas where suitable habitat with elements to support the species lifecycle are present. Recent occurrences of AWS have been documented in the proposed and connected project areas (EBRPD 2009b). Vegetation communities in the proposed and connected project areas were mapped and field verified as described above for the CRLF. In addition, field site visits with USFWS, CDFW and Ms. Karen Swaim (species expert, Swaim Biological, Inc.) were conducted to confirm habitat characteristics for the AWS. The AWS suitable habitat analysis included AWS core, dispersal, and foraging habitat. Of the 22 parks/parcels evaluated, 19 contain existing AWS suitable habitat.

Central California Coast Steelhead DPS

The CCC steelhead DPS is listed as threatened under the ESA. The DPS includes all naturally spawned anadromous steelhead populations below natural and human-made impassable barriers in California streams from the Russian River (inclusive) to Aptos Creek (inclusive). In the vicinity of the project areas, the DPS includes the drainages of San Francisco, San Pablo, and Suisun Bays.

Life history. Steelhead is an anadromous fish, meaning they live in the ocean as adults, and spawn and become juveniles in freshwater rivers and streams. Juvenile steelhead typically remain in freshwater between 1 and 4 years though they may spend up to 7 years in freshwater before moving downstream (Busby et al. 1996), then spend between 2 and 3 years in the ocean before returning to their natal streams to spawn. Steelhead require cool, clean, well-oxygenated water and appropriate gravel for spawning. Juvenile rearing habitat depends on cover, including surface turbulence and whitewater, gravel, woody debris, and shade and is extremely important in determining distribution and abundance of juvenile steelhead.

Although historical data on steelhead abundance are scarce for this DPS, it is clear that population numbers are substantially reduced from historical levels. Significant threats to this DPS include forestry, urban and rural residential development, water development, flood control, and agricultural activities and associated runoff. Numerous anthropogenic migration barriers (dams and culverts) in the streams of the DPS also impede access and potential habitat, affect sediment transport, and disrupt water flow and temperature regimes.

Critical habitat and recovery plans. Critical habitat for the CCC steelhead was designated by NMFS in 2005 (70 FR52488). The proposed and connected project areas do not overlap any designated critical habitat for the species. The closest designated critical habitat areas are San Francisco and San Pablo Bays. San Francisco Bay is less than 0.1 mile from the project areas in Miller/Knox Regional Shoreline although the project areas in Miller/Knox Regional Shoreline vary in elevation from 100 to 200 feet above San Francisco Bay. A recovery plan has not been developed for this DPS.

Potential to occur. There are six perennial creeks, Pinole Creek, San Pablo Creek, Wildcat Creek, Codornices Creek, San Leandro Creek, and San Lorenzo Creek, within 5 miles of the proposed and connected project areas that currently contain CCC steelhead DPS runs (Leidy et al. 2005; CalFish 2011). Only Wildcat Creek and San Leandro Creek extend into the proposed and connected project areas.

Wildcat Creek is located in Wildcat Canyon Regional Park and Tilden Regional Park. Wildcat Creek flows northwest through the valley between Berkeley Hills and San Pablo Ridge and passes through the City of San Pablo to enter San Pablo Bay. A concrete-lined culvert beneath a K-Mart parking lot and a Caltrans maintained drop structure at Interstate 80 restrict steelhead access to the lower creek, but these barriers may be passable during some flows (Leidy et al. 2005). Two EBRPD-managed dams in the creek's upper watershed form Jewel Lake and Lake Anza and block all upstream migration (Leidy et al. 2005).

San Leandro Creek is downstream of Lake Chabot in Anthony Chabot Regional Park. Barriers to migration in this creek have existed since 1874, with the construction of the Chabot Reservoir,

and include the Upper San Leandro Reservoir and 4-foot concrete weir, located 0.3 miles upstream from Interstate 80 (Leidy et al. 2005). Sampling upstream of the Upper San Leandro Reservoir from June 1996 to February 2001, found O. mykiss present, ranging in size from 26 millimeters (mm) to 490 mm, including several individuals with smolt characteristics (Leidy et al. 2005). These are likely resident rainbow trout that move downstream to the reservoir where they live until it is time to return to the upper watershed to spawn. These resident rainbow trout are not part of the protected anadramous CCC steelhead DPS.

4.2.3.2.2 State-Listed and Other Sensitive Wildlife Species

As shown in Table 4.2-3, several state-listed species, species of concern, and other sensitive wildlife species have potential to occur in the proposed and connected project areas based on the CNDDB search (CNDDB 2012). A total of 16 other special-status wildlife species, including species designated as species of special concern by CDFW, have moderate or higher potential to occur in the vicinity of the proposed and connected project areas, including five invertebrates, one reptile, eight birds (including two raptor species), and two mammals.

4.2.3.3 Special-Status Plant Species and Critical Habitat With Potential to Occur

4.2.3.3.1 Federally Listed Plant Species

The federally listed plant species with the potential to occur in the proposed and connected project areas include pallid manzanita (*Arctostaphylos pallida*) and Presidio clarkia (*Clarkia franciscana*). Santa Cruz tarplant is also federally listed and is present as experimentally planted populations in Wildcat Canyon Regional Park and Sobrante Ridge Regional Preserve. This experimental population is not within the proposed and connected project areas. All natural populations in the vicinity of the proposed and connected project areas are believed to be extirpated; therefore, this species is not discussed further.

Pallid Manzanita

Pallid manzanita is listed as threatened under the federal ESA and endangered under the CESA. Pallid manzanita is found only in the northern Diablo Range of California (63 FR 19842-19850). Currently, pallid manzanita occurs in several locations in the East Bay Hills in Contra Costa and Alameda Counties. The only large populations of pallid manzanita still known to exist are found at Huckleberry Ridge in Alameda and Contra Costa Counties and in Sobrante Ridge Regional Preserve in Contra Costa County. Other small, natural, and planted populations occur on public and private land in Alameda and Contra Costa Counties.

Pallid manzanita occurs primarily on north- and east-facing slopes and is restricted to nutrient poor, silica rich soils (USFWS 2002a). Although existing populations are known to occur in coastal scrub, closed-cone coniferous forest, and eucalyptus forest, the most viable populations are in areas of maritime chaparral.

Pallid manzanita, which blooms from December to March, is thought to be pollinated by bees (USFWS 2002a). This species is an obligate-seeder (i.e., it reproduces sexually from seed) and cannot resprout from burls after fire. Pallid manzanita is fire adapted and requires fire to remove

phytotoxins from the soil, which allows sprouting of young seedlings. Seeds of pallid manzanita remain viable for many years, and scarification of seeds by fire, mechanical disturbance, or by digestion is required for germination. Pallid manzanita, however, can also reproduce asexually by layering, whereby branches of an existing plant contact leaf litter and produce roots (USFWS 2002a).

Habitat destruction and fragmentation from urbanization, fire suppression, herbicide spraying, competition with non-native plants, and hybridization with planted ornamental species of *Arctostaphylos* are the primary threats to pallid manzanita.

Critical habitat and recovery plans. No critical habitat has been designated for pallid manzanita. The species is included in a draft recovery plan, *Draft Recovery Plan for Chaparral and Scrub Community Species East of San Francisco* (USFWS 2002a); however, recovery units for the pallid manzanita are not identified in this plan (USFWS 2002a).

Potential to occur. As stated above, several documented and observed CNDDB occurrences of pallid manzanita occur in the project areas, particularly in Sobrante Ridge and Huckleberry Botanic Regional Preserves (CNDDB 2012). Additional information on known occurrences of pallid manzanita was obtained from an EBRPD wildfire hazard reduction stewardship resources site assessment completed in February 2012. In addition to Sobrante Ridge and Huckleberry Botanic Regional Preserves, pallid manzanita plants also occur in Redwood, Tilden, and Sibley parks (see Figure 4.2-1c and Figure 4.2-1g). In addition, it is possible that viable seed banks likely exist within the project areas, and these activities may stimulate germination. Therefore, this species is known to occur in parts of the project areas and may occur in other areas with suitable habitat.

Presidio clarkia

Presidio clarkia is listed as endangered under the federal ESA and the CESA. Presidio clarkia is restricted to serpentine soils in grassland and costal scrub habitats (USFWS 2010b). This is the only species of *Clarkia* known to be restricted to serpentine soils. The species blooms from May to July and is thought to be primarily self-pollinating. Seeds are produced and dispersed in late summer to early fall.

Although Presidio clarkia was once thought to occur only in the Presidio in San Francisco, seven extant subpopulations have been identified in the Oakland Hills in Alameda County (USFWS 2010b). These Oakland Hills subpopulations occur within 0.5 mile of each other. One of the major threats to the survival of this species, especially populations in the Oakland Hills, is competition from non-native species. Habitat fragmentation, residential development, roadside maintenance and mowing, and hiker and biker traffic are other threats to populations of Presidio clarkia (USFWS 2010b). Vegetation management (i.e., mowing or cutting of individuals of Presidio clarkia before seed set and dispersal) is listed as a threat to subpopulations in the Oakland Hills (USFWS 2010b).

Critical habitat and recovery plans. No critical habitat has been designated for the Presidio clarkia. The species is included in a recovery plan, *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (USFWS 1998); however, only geographic areas that include

serpentine soils are described in this recovery plan, and no recovery units are identified (USFWS 1998). The geographic areas with serpentine soil identified in this plan do not overlap the proposed and connected project areas; one area (Skyline Serpentine Prairie) is adjacent to the proposed and connected project areas in Redwood Regional Park, and the other (Fairmount Ridge) is approximately 0.5 mile west of the proposed and connected project areas in Anthony Chabot Regional Park.

Potential to occur. Presidio clarkia is known to occur in Redwood Regional Park. According to EBRPD mapping, there is an approximate 0.07-acre Presidio clarkia occurrence area within the proposed and connected project areas. In addition, there is a 0.08-acre patch of serpentine bunchgrass within the same treatment area that is considered potential habitat. There are also known occurrences at the Skyline Serpentine Prairie adjacent to the proposed and connected project areas near the intersection of Skyline Boulevard and Redwood Road (CNDDB 2012). The EBRPD has ongoing restoration activities at the Skyline Serpentine Prairie to improve the habitat for the Presidio clarkia (EBRPD 2009b).

4.2.3.3.2 State-Listed and Other Sensitive Plant Species

One state-listed plant species, San Francisco popcorn-flower (*Plagiobothrys diffuses*), has high potential to occur in Redwood Regional Park. Ten other sensitive species listed by CNPS have potential to occur in suitable habitat within the proposed and connected project areas, as shown in Table 4.2-3.

4.2.3.4 Habitats of Concern

The following subsections describe habitats in the proposed and connected project areas or vicinity that are particularly sensitive or protected by specific regulations.

4.2.3.4.1 Wildlife Movement and Migration Corridors

The East Bay Hills area is a matrix of developed, landscaped, and disturbed urban areas and open space lands. As a result, the remaining habitat linkages created by open space lands play a critical role in facilitating wildlife movement or migration throughout the region. Movement corridors for individual species are most likely to occur within these habitat linkage areas. Wildlife movement corridors are defined by the functions they provide for wildlife and plant species. Beier and Loe (1992) defined these functions as providing a travel route for wide-ranging animals, allowing animals to either migrate or come into contact with mates; a route for the propagation of plant species; a spatial arrangement for genetic exchange between individuals; areas where populations can move in response to environmental change or natural disasters; and routes by which recolonization can occur where populations have been locally extirpated.

Two areas in the project vicinity have been identified in the USFWS (2002a) *Draft Recovery Plan for Chaparral and Scrub Community Species East of the San Francisco Bay* as important habitat linkages for the AWS. They are the Caldecott Tunnel Corridor area between the Tilden-Briones region and the Oakland-Las Trampas regions and the Niles Canyon-Sunol Corridor between the Hayward-Pleasanton Ridge and the Sunol-Cedar Mountain area. Although these habitat linkages were identified as potential movement corridors for the AWS, it is likely that they have the potential to provide movement corridors for the majority of the species in the East

Bay Hills and represent areas where genetic exchange may occur between wildlife populations. The Caldecott Tunnel Corridor is in the proposed and connected project areas and connects open space habitat on the north of Highway 24 (including Wildcat Canyon and Tilden Regional Parks) to those on the south (including Sibley, Huckleberry, and Redwood Regional Parks). The Niles Canyon-Sunol Corridor is not in the proposed and connected project areas, but it connects to lands in the proposed and connected project areas (southeast of Lake Chabot). These habitat linkage areas correspond with critical habitat/recovery Units 1, 2, and 6 for the AWS, discussed in Section 4.2.3.2.1.

4.2.3.4.2 Riparian Communities

Riparian communities are rare in the proposed and connected project areas. Riparian communities in the proposed and connected project areas are not defined in this document because the combinations of willow riparian vegetation community and aquatic features in the proposed and connected project areas are so varied that they do not provide a consistent definition of the riparian community. For example, most of the areas mapped as riparian woodland are associated with streams or drainages that are unnamed or too small to map on the scales of the vegetation maps. In addition, the aquatic features described in Section 4.2.2.4 are not necessarily associated with the riparian woodland vegetation community but are instead associated with a wide variety of vegetation communities. However, riparian areas are particularly sensitive to disturbance, including ground disturbance, increased erosion, and changes in soil chemistry related to nearby ground treatments.

4.2.3.4.3 Essential Fish Habitat

There is no designated EFH in the proposed and connected project areas or in the streams in the vicinity of the proposed and connected project areas. Commercially managed anadromous fish species that have designated EFH and fall under the protection of the MSFCMA include coho salmon (*Oncorhynchus kisutch*) and Chinook salmon (*Oncorhynchus tshawytscha*). Steelhead is not a commercially managed species under the MSFCMA, and as a result, EFH is not designated for the species. The CCC steelhead DPS is the only anadromous fish species with potential to occur in the proposed and connected project areas. San Francisco and San Pablo bays are designated as EFH; however, these areas are not discussed further because most of the proposed and connected project areas are a great distance from these bays. One portion of the proposed and connected project areas, the Miller/Knox Regional Shoreline, is near San Francisco Bay. However, there is no hydrological connectivity between the Bay and the Miller/Knox Regional Shoreline, and there are no hydrologic features that could transport water quality effects from the proposed and connected project areas to the Bay. Therefore, EFH is not discussed further.

4.2.3.4.4 Habitat Conservation Plans

The proposed and connected project areas are not in any habitat conservation plan (HCP) areas.

The East Bay Municipal Utility District (EBMUD) Low Effect East Bay HCP permit area is adjacent to some portions of the proposed and connected project areas (EBMUD 2008). This Plan covers seven special-status species: pallid manzanita, Santa Cruz tarplant, CCC steelhead, CRLF, western pond turtle, AWS, and pallid bat. The EBMUD HCP contains specific measures to protect covered species and their natural habitats.

The East Contra Costa HCP /Natural Community Conservation Plan (NCCP) permit area covers eastern Contra Costa County and is approximately 20 miles east of the proposed and connected project areas (East Contra Costa County Habitat Conservancy 2012).

The East Alameda County Conservation Strategy (EACCS) is not a formal HCP but rather a collaborative effort to preserve endangered species by developing and adopting a shared vision to guide long-term habitat protection in east Alameda County (East Alameda County Conservation Strategy 2012). The project area for the EACCS is approximately 3 miles east of the southernmost portion of the proposed and connected project areas.

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4.3 Fire and Fuels

The following section describes the way in which fire and fuels are described by fire science professionals, how the fire and fuels environment in the proposed and connected project areas was studied and characterized, the historic vegetation conditions and fire regime, and existing fuel hazard characteristics for each of the major vegetation communities found in the project areas.

4.3.1 Regulatory Setting

4.3.1.1 Federal

As shown in other sections of this EIS, many federal laws and regulations apply to the proposed and connected actions. However, no federal laws or regulations apply specifically to management of vegetation on nonfederal land for the purpose of reducing wildfire hazard.

4.3.1.2 State

4.3.1.2.1 Defensible Space Requirement

The California Government Code (CGC) requires the California Department of Forestry and Fire Protection (Cal Fire) to identify areas in which the state has primary financial responsibility for preventing and suppressing fires (CGC § 4125). These areas are called state responsibility areas. In other areas, the federal government has primary responsibility on federal land, and local governments have primary responsibility on nonfederal land. Cal Fire is also required to identify "very high fire hazard severity zones" in the state based on fuel loading, slope, weather, and other factors, including Diablo winds (CGC § 51178). Diablo winds are a major factor in wildfires in the East Bay Hills.

Cities and counties must have ordinances designating very high fire hazard severity zones (CGC § 51179). In the designated zones, a 100-foot defensible space must be maintained around occupied structures in or adjacent to a mountainous area or land covered with forest, brush, grass, or flammable material (CGC § 51182). Within 100 feet or up to the property line, whichever is a smaller distance, vegetation and other fuels must be maintained.

In state responsibility areas, the California Public Resources Code (PRC) requires maintenance of a 100-foot defensible space around occupied structures in or adjacent to a mountainous area or land covered with forest, brush, grass, or flammable material (PRC § 4291). Within 100 feet or up to the property line, whichever is a smaller distance, vegetation and other fuels must be maintained.

4.3.1.2.2 Regulation of Pile and Area Burning

Pile and area burning, such as that included in some of EBRPD's proposed and connected actions, is regulated by the Bay Area Air Quality Management District (BAAQMD) under its Regulation 5. Burning may only be conducted on a "permissive burn day" declared by BAAQMD's air pollution control officer (APCO) (regulation 401.15). The APCO is authorized to declare a permissive burn day when it appears that open burning will not adversely affect

ambient air quality or the downwind population based on meteorological criteria established by the California Air Resources Board for the San Francisco Bay Area Air Basin (regulation 5-206).

At least 30 days before any proposed burning, EBRPD must prepare a smoke management plan and submit it to BAAQMD for review (regulation 5-408.1). The plan must be consistent with EPA's Interim Air Quality Policy on Wildland and Prescribed Fires and must comply with other requirements listed in the BAAQMD regulation.

4.3.2 Methodology

A hazardous fire and risk analysis was conducted to determine the baseline conditions related to the wildland fuels and hazard in the proposed and connected project areas. In the analysis, data on existing vegetation and structures were combined with fire behavior modeling to develop predictions of potential fire behavior in the proposed and connected project areas.

The proposed and connected actions would modify existing vegetation through various vegetation treatments to reduce potential fire behavior. An understanding of baseline fire behavior conditions allowed a comparison of the wildfire hazard and risk in pre- and post-treatment conditions. In the following sections, the analysis parameters are defined and the methodology that was used to determine the baseline fuel and fire conditions in and near the proposed and connected project areas is described.

4.3.2.1 Fire and Fuels Parameters

The following subsections contain the definitions of vegetative fuels, fire behavior, and risk to human life and property—the parameters that were used in the wildfire hazard and risk analysis.

4.3.2.1.1 Fuels

Both vegetative and anthropogenic fuels[1] contribute to wildfire hazard because these fuels feed a fire and without them the fire ceases to burn. Vegetative fuels in wildlands include trees, shrubs, forbs, grasses, and dead and decaying organic material on the ground surface. In areas adjacent to wildlands, homes and other structures are also considered fuel. In the proposed and connected actions, only vegetative fuels are proposed for removal; therefore, they are the only model parameters used.

Fuel conditions in various vegetation communities and stand types have been studied by fire and fuel professionals to predict fire behavior and fire hazard conditions. A common way of describing vegetative fuels is to use fire behavior fuel models (FBFMs)[2] developed by the U.S. Forest Service (Scott and Burgan 2005). In FBFMs, vegetation communities are categorized according to their physical fuel properties (e.g., fuel load, fuel bed depth, moisture content) and are used as inputs to quantitative spatial modeling. FBFMs are classified into four groups:

[1] Vegetative fuels include all organic biomass that has the capacity to burn (needles, leaves, branches, roots, stems, and trunks of trees, shrubs or forbs, and grasses) while anthropogenic fuels are flammable items originating from human activity (e.g., buildings, debris, fences, wood piles, carports).

[2] These fire behavior fuel models can be thought of as fuel descriptions. Because of the potentially confusing nature of the term "model" in this context, this report refers to fuel models as "FBFMs."

grasses, brush, timber, and slash (debris), and the groups are subdivided for a total of 40 fuel models.

In the wildfire hazard and risk analysis for the proposed and connected actions, FBFMs were used to classify the vegetation communities, and the information was input into a quantitative spatial modeling program (FlamMap) to quantify the potential damage in and near the proposed and connected project areas.

4.3.2.1.2 Fire Behavior

Fire behavior, or the way in which a fire burns on a landscape, is determined by factors such as topography, aspect (the direction a slope faces), weather, vegetative fuel arrangement, and ignition. Fire behavior can be described in terms of flame length, crown fire (passive or active), and spotting, each of which is explained below.

Flame Length

Flame length is the distance between the flame tip and the base of the flame (generally the ground surface) and is an indicator of fire intensity (National Wildland Fire Coordination Group [NWCG] 2012). Flame length values are generally classified in four categories based on standard ranges: 0.1 to 4.0 feet, 4.1 to 8.0 feet, 8.1 to 11.0 feet and greater than 11.0 feet. These ranges use flame lengths that are meaningful to firefighters. For the analysis of the proposed and connected actions, structures within 200 feet of 8-foot flame lengths were assumed to be at risk. The 8-foot flame length is a nationally recognized standard over which erratic fire behavior and difficulty in control and suppression are anticipated.

Crown Fire

Crown fire advances from top to top of trees or shrubs (NWCG 2012). Crown fire activity is classified into three categories: active, torching and surface. In the surface fire category, little or no tree torching or active crowning is expected. During passive crown fire activity, isolated torching of trees or groups of trees is observed and the fire only moves through the canopy for short distances. During active crown fire activity, sustained runs through the canopy occur that may be independent of surface fire activity. Both torching and crown fire lead to spotting, explained below.

Spotting

Spotting is production of sparks or embers that are carried by heat currents or wind and start new fires beyond the zone of direct ignition by the main fire (NWCG 2012). Structures can be lost in fires started by embers landing on or wedging into flammable building components, or penetrating to the interior through vents or other access points. The potential for spotting indicates that structures that are beyond the range of the flames of the main fire may still be at risk due to exposure to ember cast. Since accurate, explicit modeling of ember cast is problematic, crown fire activity (either passive or active crown fire) was used in the analysis to represent spotting potential (McHugh 2013).

4.3.2.1.3 Risk to Life and Property

The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel is referred to as the wildland-urban interface (WUI). Wildfires in and around the WUI are particularly hazardous to humans because of the presence and arrangement of at-risk values.[3] The purpose of wildfire hazard and risk reduction in the WUI is to protect life and property, which includes not only humans, homes, pets, and possessions occupying the WUI but also firefighters and firefighting equipment that are brought into the WUI during the suppression effort. Two important considerations in assessing the risk associated with a wildfire are fire suppression guidelines and proximity of fuels to structures.

Fire Suppression Guidelines

An important aspect of assessing fire risk is determining how readily a potential fire can be suppressed. The availability of trained firefighters is only one part of the assessment. The success of wildfire suppression is also highly dependent on factors such as fuel type and volume (fuel load) and flame length. Fires with flame lengths in excess of 4 feet are considered to be the upper limit of fires that can be suppressed using manual tools. As flame lengths exceed 4 feet, the risk to firefighters on the ground increases, making direct attack on the flaming front too dangerous. Flame lengths of 8 feet or greater will make suppression at the flaming front of a fire very difficult or ineffective, even with adequate water supply such as hydrants. Fire suppression can be attempted using aircraft and other remote tools when flame lengths are in this category. Flame length was predicted for the proposed and connected project areas to determine current suppression feasibility and how changes in vegetative structure may change suppression potential.

Proximity of Fuels to Structures

Proximity of fuels to structures, especially proximity of fuels likely to exhibit extreme fire behavior, is another important aspect of fire risk. Mitigating fire risk to structures typically includes reducing or removing fuels close to the structure by creation of a defensible space. Defensible space constitutes the area around a structure that has been managed to allow firefighters to protect the structure from an oncoming fire. Fuelbreaks are another way to mitigate fire risk. A natural or artificial change in fuel characteristics that affects fire behavior so that fires burning into them can be more readily controlled is referred to as a fuelbreak (NWCG 2012). The majority of the projects evaluated in this EIS fit into this category.

Threat to structures can be in the form of heat transfer (conductive, radiant, and convective) or in the form of exposure to embers generated by nearby fuels. Both of these types of exposure were addressed in the analysis. Structures were analyzed for exposure to predicted flame lengths greater than 8 feet within 200 feet of the structure. Similarly, structures were analyzed for their exposure to embers coming from shrub fuel types within 1,000 feet and forest fuel types within 2,000 feet. As stated above, areas predicted to experience either torching or active crown fire activity were assumed to be sources of embers.

[3] People, property, ecological elements, and other human and intrinsic values within the project area. Values at risk are identified by inhabitants as important to the way of life of the study area and are specifically susceptible to damage from undesirable fire outcomes.

4.3.2.2 Modeling and Analysis of Fire Hazard

Fuel conditions and prevailing weather conditions were input into a quantitative spatial model (FlamMap version 5.0.1.2 64 bit)[4] to predict fire behavior. This allowed comparison among the project areas and an assessment of how the proposed and connected actions as a whole would perform within the larger regional landscape.

FlamMap yields a prediction of likely fire behavior, given a standardized set of conditions and a single point source ignition at every 30-meter-by-30-meter cell on the landscape. It does not consider cumulative impacts of increased fire intensity over time and space. The model does not calculate the probability that a wildfire will occur. It assumes an ignition occurrence.

Weather conditions are extremely variable and all possible combinations cannot be accounted for. The model outputs are best used as one tool in planning and not as a stand-alone product for tactical planning. Whenever possible, fire behavior calculations should be done using actual weather observations made during a fire. The most current burn indices (BI) should also be calculated and distributed during the fire season to be used as a guideline for fire behavior potential.

The following weather and fuel moisture inputs were used for the modeling.[5]

Table 4.3-1. Weather and Fuel Moisture Inputs

20 foot windspeed	22 mph
Wind direction	60° Azimuth
1 hour fuel moisture	2%
10 hour fuel moisture	3%
100 hour fuel moisture	7%
Live herbaceous fuel moisture	70%
Live woody fuel moisture	70%
Foliar moisture content	70%

FlamMap's fire behavior modeling process for surface fire draws heavily from the BEHAVE fire behavior prediction and fuel modeling system.[6] BEHAVE is a nationally recognized set of calculations used to estimate a surface fire's intensity and rate of spread given certain topographical, fuel, and weather conditions.

The BEHAVE modeling system has been used for a variety of applications, including predictions of current fires, prescribed fire planning, fuel hazard assessment, initial attack dispatch, and fire prevention planning and training. Predictions of wildland surface fire behavior are made for a single point in time and space, given user-defined fuels, weather, and topography.

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[4] http://www.firemodels.org/

[5] An explanation of these values can be found in Appendix M.

[6] Patricia L. Andrews, producer and designer, Collin D. Bevins, programmer and designer, The Joint Fire Sciences Program of the Rocky Mountain Research Station (USDA Forest Service, Missoula, Montana) and Systems for Environmental Management (Missoula, Montana).

The following assumptions are built into BEHAVE:

- Fire is predicted at the flaming front (fire behavior is not modeled for the time after the flaming front of the fire has passed)
- Fire is free burning (uncontrolled by suppression efforts)
- Behavior is heavily weighted toward the fine fuels (grasses and small-diameter wood)
- Fuels are continuous and uniform
- Fires are considered to be surface fires (crown fire activity is modeled separately)

BEHAVE makes calculations at a single point. To make calculations for an entire landscape (important for predicting the effects of a wildfire at the community, district, or county scale), fire behavior is modeled using FlamMap, which models surface fire predictions and the potential for crown fire development (Van Wagner 1977).

The following assumptions are built into FlamMap:

- Each calculation in a given area is independent of calculations in any other area. Fire is not modeled dynamically across the landscape but statically as a series of individual calculations.
- Weather inputs such as wind and fuel moistures do not change over time.
- Fire behavior modeling calculations are performed in a series of uniform squares (or "pixels") across the landscape. These pixels determine the level of detail, and nothing smaller than a pixel (30 meters by 30 meters in this case) is included in the modeling.

Crown fire activity and flame length are derived from the fire behavior predictions. A limitation of FlamMap is that crown fire is not automatically calculated for shrub models. An adjustment of the canopy cover for shrubs must be made to allow the model to assess torching or crowning.

Outputs from FlamMap were used as the starting point for further analyses described in Section 4.3.3.3 below.

4.3.3 Existing Conditions

A wildland is defined as "an area in which development is essentially nonexistent, except for roads, railroads, powerlines, and similar transportation facilities. Structures, if any, are widely scattered" (NWCG 2012). Wildfire is defined as an unplanned, unwanted wildland fire, including fires that were begun intentionally and escaped the control of the people who started them. The area of highest risk to life and property from wildfire is the boundary where wildlands and urban landscapes meet, referred to as the WUI. The proposed and connected project areas include areas of WUI.

The following sections describe the historic vegetation conditions and fire regime and existing fuel hazard characterization for each of the major vegetation communities found in the proposed and connected project areas.

4.3.3.1 Historical Conditions

In North America, the term “historical conditions” refers to those that prevailed prior to European settlement. Historic vegetation conditions were in many cases heavily influenced by the practices and settlement patterns of Native Americans.

4.3.3.1.1 Historical Vegetation Conditions

It is estimated that prior to European settlement in California, more than half of the East Bay Hills was open grasslands and rolling oak savannas. Isolated groves of coast redwood occurred on hillsides in perennially moist drainages running east to west or west to east. European settlers introduced not only grazing by cattle and other animals but fire suppression, both of which changed the vegetation dramatically. Grazing animals carried non-native grass seed from Europe, and European settlers did not use burning to maintain wide, open grasslands as the Native Americans had done. European settlers also introduced new tree species to the East Bay Hills, notably blue gum eucalyptus, which was introduced in the early 1900s for its beauty and potential function as a crop.

The non-native grass seed was successful in the California landscape and transformed the East Bay Hills from a native California grassland dominated by perennial bunchgrasses to one dominated by hearty, European annual grasses and forbs. The annual plants contribute to the current fuel load via the aboveground biomass, which dries out and remains at the end of the growing season. In the absence of regular small burns, shrub species and oak and bay seedlings proliferated, and the landscape was transformed into a mosaic of actively grazed grassland patches within a shrub-tree matrix.

Grazing pressure has diminished in the proposed and connected project areas since the creation of EBRPD 50 years ago. This reduction in grazing has caused a proliferation of shrubs in areas that were previously dominated by grasses maintained by grazing animals, and forest cover has increased in some areas that were previously dominated by grasses and shrubs (Russel and McBride 2003).

4.3.3.1.2 Historical Fire Regimes

The accumulation of native and non-native vegetative fuels has caused a shift in fire regimes in the East Bay Hills. Historically, fire has played an integral part in North American ecosystems, helping to shape vegetation structure and biological diversity. In the last 100 years, the act of fire-suppression has reduced, and in many cases removed, the influence of fire on the landscape, effectively removing a vital process from many ecosystems. Because of the elimination of fire and the coincidental increase in non-native species, vegetative fuels have accumulated to higher levels than would have existed with more frequent fires. In part, non-native species produce greater fuel loads than the native vegetation they displace because of the absence of organisms (insects, soil microbes, and other plant species) from their native landscape that evolved with them and moderated their proliferation. In the East Bay Hills, non-native trees, such as eucalyptus and Monterey pine, also produce greater fuel loads because the plants themselves are bigger.

The ignition sources of fires in the historical vegetation communities in the East Bay Hills were both natural and human-caused. Fires often burned over great distances (even multiple counties) before encountering natural barriers, such as water bodies, rocky slopes, or recently burned areas. Analysis of tree rings and other vegetative evidence suggests that fire frequency was not constant across the landscape and depended on the type of vegetation. In general, grasslands burned more frequently than scrub or shrub lands, scrub burned more frequently than some forests, and other forests burned rarely, if at all (Barbour et al. 1993).

The recurrence interval for fires in the East Bay Hills before 1930 is estimated to have been between 10 and 30 years. The current recurrence interval is between 25 and 35 years depending on topography and exposure[7] (Davis and Borchert 2006). Since 1930, the majority of fires have been human caused, first from controlled burning for rangeland improvement and more recently from accidental ignitions.

4.3.3.2 Fire Characteristics of Major Types of Vegetation

The vegetation communities in the proposed and connected project areas include oak-bay woodland, Monterey pine forest, redwood forest, eucalyptus forest, coastal scrub, coyote brush scrub, and grasslands. The dominant species in these vegetation communities may occur in single-species stands or may be interspersed with other species. The fire characteristics of these vegetation communities are described in the following subsections. Other characteristics of these vegetation communities are described in Section 4.2.2.2. Monterey pine is the dominant component of the coniferous forest community discussed in Section 4.2.2.2 and this vegetation community is referred to as Monterey pine forest here in Section 4.3.

4.3.3.2.1 Oak-Bay Woodland

Fire hazard in oak-bay woodlands is variable due to inconsistency in surface fuels in the understory but usually is on the lower end of the hazard spectrum. Flame lengths between 1 and 34 feet can be expected. Crown fire is possible with heavier surface fuel loading. Ignitability can be high if surface fuels are grass or shrub with large amounts of dead material. Closed-canopy oak-bay woodlands with minimal surface fuels are the least hazardous of all vegetation types in the study area (EBRPD 2009b).

4.3.3.2.2 Monterey Pine Forest

Monterey pine forests were established via planting in the early 1900s. Fire hazard in these forests can differ depending on surface fuel variability, but flame lengths between 2 and 16 feet are predicted. Mature forests are relatively easy to ignite, especially if grass or litter is present in the understory. Disturbance interactions between insect attacks and fires can cause accumulation of dead fuels (EBRPD 2009b). Monterey pines have serotinous cones and can reproduce effectively after a fire (National Park Service [NPS] 2004).

[7] Exposure is defined as “A position in relation to climatic or weather conditions or points of the compass” (American Heritage Dictionary 2000)

4.3.3.2.3 Redwood Forest

Redwood is a fire-enhanced, facultative sprouting species. Seeding rates and establishment are both lower in the absence of fire because of low seed viability and problematic ground conditions (limited access to the bare mineral soil required for seed germination) (Olson et al. 1990). Redwood stands typically experienced moderate intensity surface fires that burned in the summer and early fall with variable recurrence intervals based on site moisture (wetter sites had longer recurrence intervals than drier sites) (Stuart and Stephens 2006). Flame lengths are predicted to be between 7 and 31 feet depending on fuel volume and slope (EBRPD 2009b). Fire recurrence intervals in the southern, driest extent of the species' range, including the East Bay Hills, historically ranged between 6 and 44 years depending on proximity to Native American villages and travel corridors, microclimate, and fuel anomalies (Stuart and Stephens 2006).

4.3.3.2.4 Eucalyptus Forest

In its native Australian landscape, Tasmanian blue gum eucalyptus, the dominant eucalyptus species in the East Bay Hills, is adapted to high-frequency, low-intensity fires that clear understory material and rarely kill large trees. The Tasmanian blue gum species evolved in a fire-prone environment, and the thick bark on adult trees resists burning in all but the hottest fires (Klinger et al. 2006). The leaves of the blue gum eucalyptus have a high content of volatile oils. The combination of litter build-up and high oil content in this vegetation community results in easily ignited and high-intensity fires. They are also observed and documented to be prolific generators of firebrands or embers when fires occur (Koo et al. 2010; Trelles and Pagni 1997, in Fire Safety Science—Proceedings of the 5th International Symposium). Flame lengths in a surface fire between 6 and 21 feet are expected (EBRPD 2009b).

4.3.3.2.5 Northern Coastal Scrub (Xeric and Mesic)

Xeric northern coastal scrub can represent extreme hazard conditions with flame lengths between 14 and 69 feet expected. Mesic northern coastal scrub would produce less extreme flame lengths than those of xeric northern coastal scrub due to higher persistent foliar moisture. Both northern coastal scrub types are not easily ignited but can sustain rapid burning in dry weather. These plant communities are adapted to fire and can propagate via resprouting or fire-triggered germination in the wake of a fire (EBRPD 2009b).

4.3.3.2.6 Coyote Brush Scrub

Flame lengths in coyote brush scrub are expected to be between 14 and 32 feet, varying with specific vegetation composition and topographic context. Coyote brush scrub contains greater volume and more large-diameter material than the coastal scrub vegetation described above. Torching in overstory trees is expected. Resprouting and fire-triggered germination are expected following fires (EBRPD 2009b).

4.3.3.2.7 Grasslands

Grasslands, depending on the type, can be very ignition-prone. They are capable of generating flame lengths between 2 and 10 feet. While they do not have the capacity to generate embers that carry for long distances, they are considered to be dangerous because of the potential for rapid

rates of fire spread. Adapted to fire, grasslands rejuvenate relatively quickly following fire by either resprouting or germination from seed (EBRPD 2009b).

4.3.3.3 Existing Fire Hazard Characterization

The East Bay Hills currently has a complex mosaic of native and introduced vegetation that presents a severe fire hazard for residents and structures in the WUI. The most dramatic change in the fire regime is the result of the introduction of non-native blue gum eucalyptus to the East Bay Hills. The existing fire regime for most of the vegetation in the East Bay Hills is considered a Fire Regime IV[8]—a high-severity, stand-replacing regime. Although fire frequency has decreased over time due to fire suppression efforts, changes in vegetation from suppression efforts promote fires that burn with greater intensity and greater severity when ignited.

The FlamMap fire behavior prediction model was used to calculate the wildfire hazard in each proposed and connected project area based on predicted flame length crown fire activity and ember cast in the project areas. To assess the worst-case scenario, all fire behavior predictions assumed Diablo wind conditions, which are characterized by extremely hot, dry weather and strong winds from the northeast.

The selection of treatment areas for consideration under the Wildfire Hazard Assessment model was based on the need to protect life and property and an elevated hazard potential resulting from the following factors:

- Proximity of ember-generating vegetation to homes and other structures
- Proximity of vegetation with the potential to produce greater than 8-foot flame lengths

Results of the fire hazard analysis provided fire behavior predictions for the current vegetation communities and conditions in the proposed and connected project areas. The results included estimates of the potential flame lengths, crown fire activity and associated ember cast of the fire based on the fuel characteristics and proximity to vulnerable structures.

The results of the modeling for each proposed and connected project area are included in Section 5.2.

Flame lengths and crown fire activity values for the proposed and connected actions and the no action alternative were exported from the FlamMap fire behavior modeling runs referred to above. Mean values[9] were calculated for flame length and converted to one of the standard flame length categories discussed in Section 4.3.2.1.2 above. Maximum crown fire activity within each project area was calculated by determining the most severe category (surface fire, torching or active crowning) in each area. The table simply contains a “Yes” for a given area if at least one cell within the area exhibited either torching or active crown fire. These results are presented in Section 5.2.

[8] Not applicable to grasslands, redwoods and oak/bay forests without understory shrubs.
[9] For explanation of why mean FL values and Max Crown fire values were used see appendix M.

The structure threat analysis was initiated by using the same outputs of the FlamMap fire behavior modeling runs. Modeled cells of flame lengths greater than 8 feet were exported from each of the fire behavior runs (one for each alternative). Structures within 200 feet[10] of these higher flame-length cells were tallied and associated with the project area that contained the cell with a flame length greater than 8 feet. Structures could be counted multiple times if they were near multiple project areas with flame lengths greater than 8 feet. Total numbers of structures impacted by each project area are provided in Section 5.2.

To assess threat to structures from ember cast, cells with torching or active crowning were associated with the project area in which they occurred. If the cells were in shrub fuels, the distance within which structures were assumed to be exposed was 1,000 feet. If the fuel was in forest fuels, the distance used was 2,000 feet. Similar to the methodology used above, if a structure was within the ember exposure zone, it was tallied and associated with the area that contained the cell producing the embers. Again, because the structure could be exposed from embers generated in more than one project area, each structure could be counted in the results for more than one project area.

[10] This methodology is consistent with EBRPD Environmental Impact Report (EIR).

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4.4 Geology, Seismicity, and Soils

Soil erosion as a result of wildfire, slope failure, landslide activity, or vegetation management activities represents a potential effect of the proposed and connected actions and the no action alternative. Therefore, this section presents existing conditions in the East Bay Hills region and the proposed and connected project areas related to soils, geology, and geologic hazards, including earthquakes and landslides.

Section 4.4.1 describes existing conditions for geology and geologic hazards, and Section 4.4.2 describes the main soil types and properties in the proposed and connected project areas. Section 5.3 analyzes potential impacts related to soil erosion as a result of implementing the proposed and connected actions and the no action alternative.

4.4.1 Geology and Geologic Hazards

4.4.1.1 Regulatory Setting - Geology and Geologic Hazards

Regulatory requirements potentially applicable to geology and geologic hazards are summarized in the following subsections.

4.4.1.1.1 California Public Resources Code Chapter 7.8, 1990 Seismic Hazards Mapping Act

The 1990 Seismic Hazards Mapping Act (California Public Resources Code § 2690-2699.6) was enacted to minimize loss of life and property from strong ground shaking, liquefaction, landslides, or other ground failures as a result of earthquakes. The Act requires the California Geological Survey (CGS) to identify and map areas with the potential for liquefaction, landslides, or ground shaking. Cities and counties use these maps in their land use permitting processes and in preparing the safety elements of their general plans (CGS 1991). Permits for development projects are not issued until geologic investigations have been completed and mitigation has been developed to address any seismic hazard issues. Because the proposed and connected actions would not involve construction and are not a “project” within the meaning of the Seismic Hazards Mapping Act, the act does not apply (California Public Resources Code § 2697, 2693(d), 2621.6).

4.4.1.2 Existing Conditions – Geology and Geologic Hazards

4.4.1.2.1 Methodology

The baseline data presented in this section were developed based on review of maps and reports from U.S. Geological Survey (USGS) and the California Division of Mines and Geology (now Geological Survey of California [CGS]), published and peer-reviewed scientific literature, seismicity catalogs, and other available nonproprietary geologic and seismologic data.

4.4.1.2.2 Land Forms and Geology

Regional Geologic Setting

The proposed and connected project areas are in the central section of the Coast Ranges geomorphic province. This province is characterized by a north-northwest-trending series of mountains and intervening valleys that extend from the Oregon border south to the Transverse Ranges of Southern California (CGS 2002). The San Francisco Bay Area consists primarily of north- northwest-trending mountain ranges and intervening valleys that are characteristic of the Coast Ranges geomorphic province (CGS 2002). The Coast Ranges include the Mendocino Range north of the bay, the Santa Cruz Mountains west of the bay, and the Diablo Range east of the bay. To the east, the Coast Ranges are bounded by the Great Valley geomorphic province. The northeastern corner of the East Bay Hills is in this province.

Local Geologic Setting

Table 4.4-1 summarizes the geologic age, formations, general lithographic composition, and general landslide susceptibility rating of the geologic features underlying the area of the proposed and connected actions.

Table 4.4-1. Generalized Geologic Description and Time Scale

Geologic Age (Absolute Age)[1]	Formation Name	General Lithographic Description	Relative Landslide Susceptibility Rating
Quaternary (Holocene and Pleistocene) (0-2)	Alluvium	Includes all types of alluvial deposits.	Varies
Tertiary (Miocene and Pliocene) (2-5)	Contra Costa Group (Bald Peak Basalt and Siesta Formation) Moraga Formation Orinda Formation	Conglomerate, sandstone, siltstone with minor amounts of limestone and tuff; rapid face changes. Some basalt and andesite (volcanic) flows. Clastics are semi-consolidated and contain montmorillonite day. Topographic form highly variable.	Varies (Miocene and Pliocene sedimentary rocks) Medium (Moraga Formation) High (Orinda Formation)
Cretaceous (66-144)	Great Valley Sequence	Great Valley Sequence: massive beds of sandstone alternating with siltstone and shale. Minor conglomerate, limestone and lignite. Complex folding and faulting. Crops out in Briones and Diablo Range.	High (Redwood Canyon Formation) Low (Joaquin Miller Formation)
Cretaceous-Jurassic (In part contemporaneous with Great Valley Sequence and Tertiary rocks)	Franciscan Assemblage	Cretaceous-Franciscan: rhythmically bedded greywacke Jurassic Assemblage sandstones, shale, siltstones, radiolarian chert, and greenstone. Minor amounts of limestone and schist. Partially recrystallized and intruded by serpentine and associated igneous rocks. Strongly deformed.	High

Source: County of Contra Costa 2005d; USGS 2000; EBRPD 2009d.
Notes: [1] Unit of absolute age are millions of years before present times.

4.4.1.2.3 Geologic Hazards

As described in the Contra Costa County General Plan, aside from earthquakes (described below), one of the major geologic hazards in the county includes unstable hill slopes (County of Contra Costa 2005d). Slopes may suffer landslides, slumping, soil slips, and rockslides. The primary factors influencing the stability of a slope are soil/bedrock lithology, slope geometry, rainfall, and pre-existing landslide deposits. Landslides are characterized as the most common form of ground failure not caused by earthquakes and are more common under wet soil conditions and on steeper slopes (greater than 15%). There are many areas within the proposed and connected project areas that have slopes greater than 26% (County of Contra Costa 2005d). As shown in Table 4.4-1, many of the geologic formations underlying the proposed and connected project areas are characterized by high landslide susceptibility ratings (USGS 1997; County of Contra Costa 2005d; and, EBRPD 2009f).

The Orinda formation, which consists of clay-rich zones, is particularly susceptible to slope instability. The proposed and connected project areas in Wildcat Canyon Regional Park are on the Orinda formation (See Figure 4.4-1a). Table 4.4-2 summarizes the areas of different landslide susceptibilities in the proposed and connected project areas.

Table 4.4-2. Distribution of Landslide Susceptibilities within the Proposed and Connected Project Areas

Project Area	Landslide Susceptibility[(1)]	Acreage[(4)]	Percent of Proposed and Connected Project Areas[(5),(6)]
Proposed project areas	Mostly landslides[(2)]	199.5	19.9%
	Few landslides[(3)]	797.5	79.8%
Connected project areas	Mostly landslides	279.0	26.3%
	Few landslides	779.4	73.5%
Total	Mostly landslides	478.5	23.2%
	Few landslides	1,576.9	76.6%

(1) As described by USGS (1997), the best predictor of landslides and where they may occur is the distribution of past landslide movements. These values are based on the distribution of landslides evident in the landscape of the San Francisco Bay Region.
(2) Mostly landslides: defined as consisting of mapped landslides, intervening areas typically narrower than 1,500 feet, and narrow borders around landslides. These areas are defined by drawing envelopes around groups of mapped landslides.
(3) Few landslides: defined as containing few, if any, mapped landslides but locally containing scattered small landslides and questionably identified larger landslides. These areas are defined by excluding groups of mapped landslides and are defined directly in areas containing the “many landslides” unit by drawing envelopes around areas free of mapped landslides.
(4) Acreages exclude minor components of surficial deposits and water in the proposed and connected project areas.
(5) Based on total acreage of 2,058.9
(6) Percentages may not add up to 100% due to excluding the surficial deposit and water acreages in the proposed and connected project areas as well as due to rounding.

Figures 4.4-1a through 4.4-1c show the distribution of landslide potentials in the proposed and connected project areas. Areas in the figures categorized as “mostly landslides” consist of mapped landslides and narrow borders around landslides. While many of these areas represent historical landslides, any area that contains landslides can represent a potential slope stability hazard (EBRPD 2009f).

4.4.1.2.4 Seismicity and Seismic Hazards

Historical Seismicity

The San Francisco Bay region is on the boundary between the North American and Pacific tectonic plates. The Pacific plate is moving northwest relative to North America across a plate boundary zone oriented north-northwest that is approximately 100 kilometers wide. This boundary zone encompasses all the major faults in northern California. The relative motion across this plate boundary amounts to between 39 and 41 millimeters per year, with the majority of this motion occurring during large earthquakes (USGS 2003). Geologically, this region is one of the most active in the world, highlighted by the number of large, damaging earthquakes that have occurred. The East Bay Hills were formed, and continue to rise, as a result of tectonic forces generated by the San Andreas Fault Zone, in which the Hayward fault is located (EBRPD 2009f). Major earthquakes have occurred on the San Andreas and Hayward faults, located along the western and eastern sides of San Francisco Bay, respectively. Some slip also occurs as a seismic fault creep (i.e., fault movement that does not generate earthquakes) on the Hayward, Concord, and Calaveras faults (Galehouse 1992). The Concord fault crosses Suisun Bay to the north of the proposed and connected project areas, and the Calaveras fault runs through San Ramon and Pleasanton to the east of the proposed and connected project areas. Historical seismicity for the San Francisco Bay region is associated primarily with the strike-slip faults of the San Andreas system.

Seismic Hazards

The majority of contemporary seismicity in the Bay Area is associated with the major faults, namely, the Hayward, Rodgers Creek, San Gregorio, Calaveras, and San Andreas faults, or related secondary faults within about 5 kilometers of the major faults (Zoback et al. 1999). The following sections discuss seismic hazards in more detail.

Surface Rupture

Surface rupture occurs when the ground surface is disrupted by fault movement during an earthquake. The Hayward Fault Zone approximately parallels the western edge of the proposed and connected project areas, most of which is on the ridges of the East Bay Hills.

The Hayward Fault Zone (northern Hayward Section) runs along the western side of the East Bay Hills. Other minor faults in the vicinity of the northern-most proposed and connected project areas, including Miller/Knox Regional Shoreline, Wildcat Canyon Regional Park, Sobrante Ridge Regional Preserve, Tilden Regional Park, Claremont Canyon Regional Reserve, Strawberry Canyon-PDM, Frowning Ridge-PDM, and North Hills-Skyline-PDM areas, include Pinole Fault, Moraga Fault, and Wildcat Fault. In the vicinity of Sibley Volcanic Regional Preserve, Huckleberry Botanic Regional Preserve, and Redwood Regional Park, minor faults include Miller Creek Fault and Chabot Fault. The major and minor faults in the vicinity of the proposed and connected project areas are at Anthony Chabot Regional Park, Leona Canyon Regional Open Space Preserve, and Lake Chabot Regional Park. The Hayward Fault is categorized as a Historic Fault Zone, with the most recent activity occurring less than 150 years ago. The other faults in the area are all categorized as Quaternary fault zones, with the most recent activity occurring less than 1.6 million years ago (California Department of Conservation [DOC] 2010).

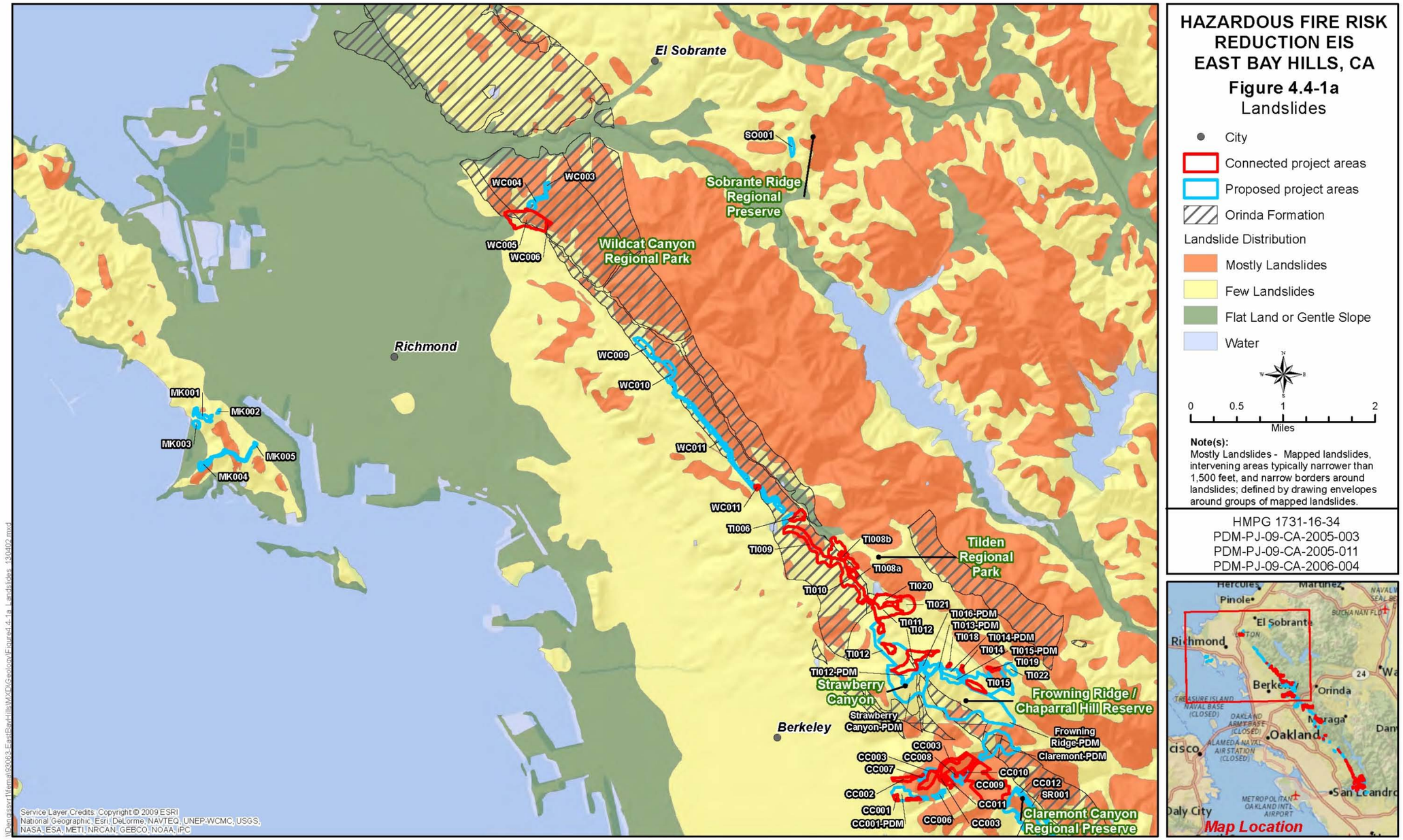

Figure 4.4-1a. Landslides

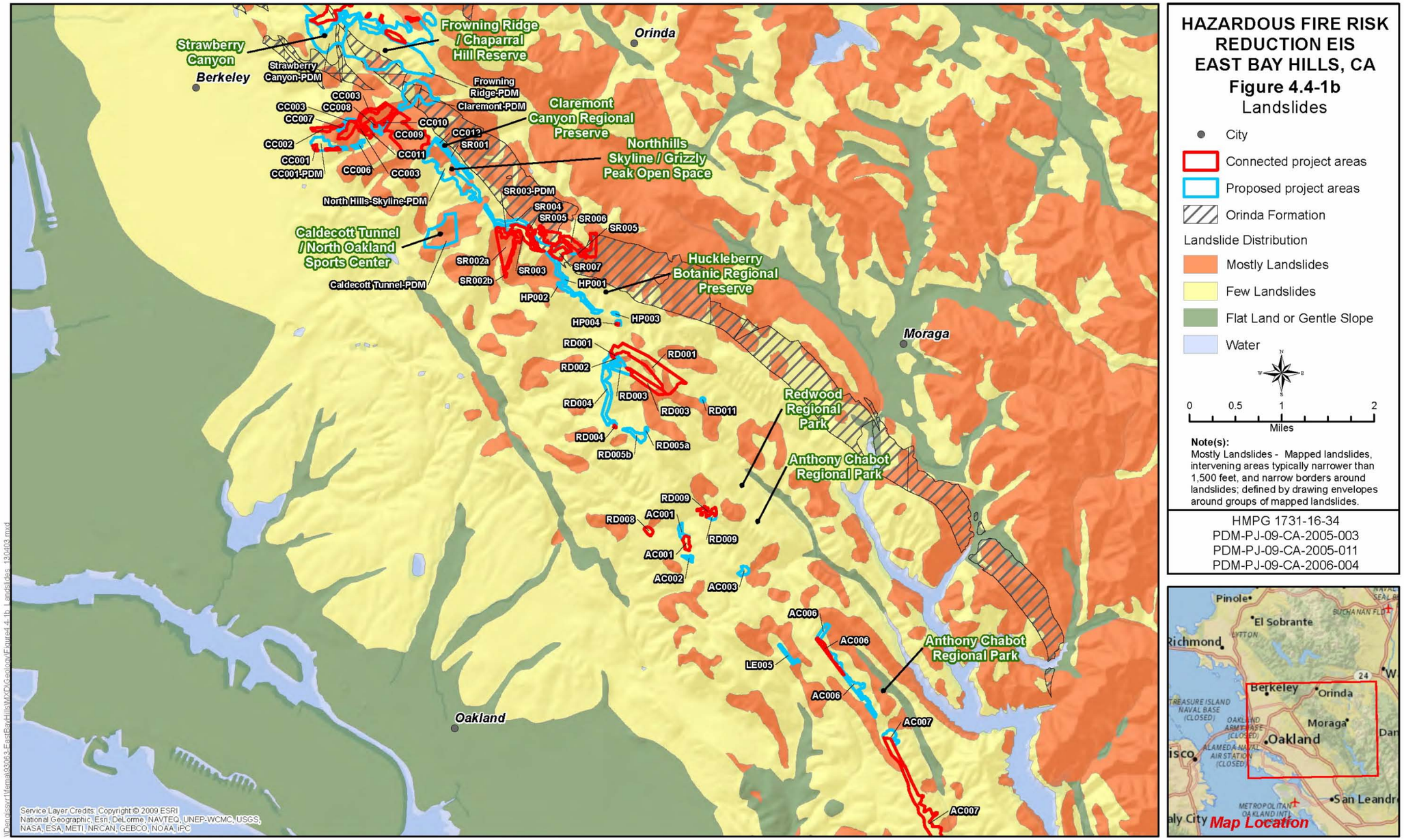

Figure 4.4-1b. Landslides

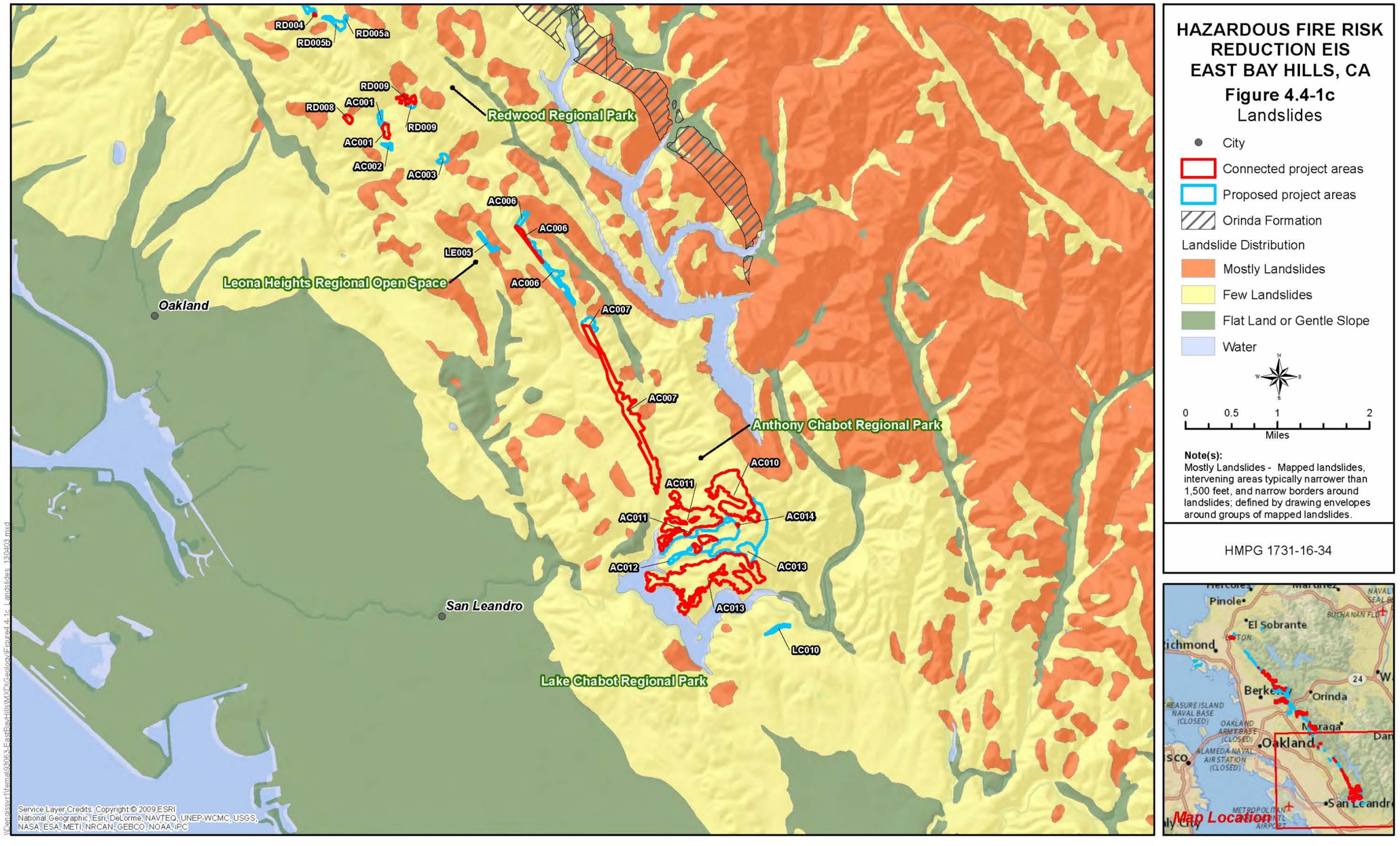

Figure 4.4-1c. Landslides

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Ground Shaking and Liquefaction

Strong earthquake ground shaking is probably the most common seismic hazard that can be expected in the San Francisco Bay Area. The amount of shaking at a site is a function of earthquake magnitude, source (i.e., type of fault), distance between the site and the source, site geology, and how the earthquake waves decrease as they travel from their source to the site in question. More shaking occurs at a particular site as the earthquake's magnitude increases and the distance between the source and site decreases. The geologic materials through which the earthquake energy travels toward the site act to decrease the amount of shaking.

The proposed and connected project areas are in a region of high seismicity, and the entire area would experience strong ground shaking in the event of a nearby earthquake. Low-lying areas underlain by soft soils would tend to have more intense shaking than areas underlain by bedrock. Strong ground shaking can trigger landslides on hillsides and cause liquefaction of saturated granular soils.

Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking. Liquefaction and related phenomena have been responsible for tremendous amounts of damage by earthquakes around the world. Liquefaction is the transformation of a granular material from a solid state into a liquefied state as a consequence of increased pore pressure and decreased effective stress (USGS 1973). Increased pore pressures in unconsolidated sediment, especially in western California, typically result from seismically induced deformation. Observed types of ground failure resulting from liquefaction can include sand boils, lateral spreads, ground settlement, ground cracking, and ground warping (USGS 1978). Liquefaction occurs in saturated soils; thus, soil layers in areas where groundwater is close to the surface have higher liquefaction potential than areas where groundwater is deeper (EBRPD 2009f). As described in the EBRPD Wildland Hazard Reduction and Resource Management Plan EIS (EBRPD 2009f), regional liquefaction mapping indicates that the majority of the upland study area is rated very low for liquefaction hazard. Some exceptions exist in small areas near Wildcat and San Leandro Creeks.

In a fact sheet published in 2003, the USGS estimated that there was a 62% probability that, between 2003 and 2032, a 6.7 or greater magnitude earthquake would occur in the San Francisco Bay Region. The probability of a 6.7 magnitude or greater earthquake occurring along individual faults was estimated to be 21% along the San Andreas fault, 10% along the San Gregorio fault, 27% along the Hayward-Rodgers Creek fault, and 11% along the Calaveras fault (USGS 2003).

4.4.2 Soils

This section contains a discussion of the soils in the proposed and connected project areas, including an overview of soil types, productivity, and existing erosion potential.

4.4.2.1 Regulatory Setting - Soils

4.4.2.1.1 Clean Water Act

The federal Clean Water Act (CWA) includes provisions for reducing soil erosion to preserve water quality. The CWA is discussed in detail in Section 4.5, Water Resources.

4.4.2.1.2 Clean Air Act

The federal Clean Air Act (CAA) includes provisions for reducing soil erosion to preserve air quality. Exposed soil surfaces are vulnerable to wind erosion, which carries small soil particulates into the atmosphere. Suspended particulate matter is one of the six criteria air pollutants regulated under the CAA. Standards for particulate matter and additional details about and applicability of the CAA are provided in Section 4.6, Air Quality.

4.4.2.1.3 Porter-Cologne Water Quality Control Act of 1969

The state Porter-Cologne Water Quality Control Act established the State Water Resources Control Board (SWRCB) and nine regional boards that regulate water quality. The regional boards carry out the National Pollutant Discharge Elimination System permitting process for point source discharges and the CWA Section 401 Water Quality Certification Program. Additional information is provided in Section 4.5, Water Resources.

4.4.2.1.4 East Bay Regional Park District Policies

EBRPD is in the process of updating its 1997 Master Plan. Public comment was accepted until early February 2013.

The draft 2012 Master Plan states the importance of preventing soil loss due to landslides and wind and water erosion and recognizes the need to protect the quality of streams, lakes, other water resources, and fish habitat by controlling soil erosion. The draft plan states that the most successful long-term approach to controlling soil erosion is to maintain vegetative cover and vegetation residue (EBRPD 2012d). Soil erosion and prevention of sedimentation are described in the Natural Resource Management section of the draft 2012 Master Plan. Natural resource management policy 13 is as follows:

> The District would identify existing and potential erosion problems and take corrective measures to repair damage and mitigate causative effects. The District would manage the parks to assure that an adequate cover of vegetation remains on the ground to provide soil protection. Where vegetative cover has been reduced or eliminated, the District would take steps to restore it, using native or naturalized plants adapted to the site. The District would minimize soil disturbance associated with construction and maintenance operations and avoid disruptive activities in areas with unstable soils, whenever possible. The District would arrest the progress of active gully erosion, where practical, and take action to restore these areas to stable conditions. The District would notify adjacent property owners of potential landslide situations on District lands to warn of potential risks and conform to applicable law, and would protect important geological and paleontological features from vandalism and misuse.

4.4.2.2 Existing Conditions – Soils

4.4.2.2.1 Methodology

Information on soils in the proposed and connected project areas was obtained from the Soil Survey of Contra Costa County (United States Department of Agriculture [USDA] 1977), the Alameda Area Soil Survey (USDA 1966), the Soil Survey of Alameda County, Western Part (USDA 1981), and current soil information from the USDA Web Soil Survey. Information on

soil erosion came from USDA soil surveys as well as from the soil erosion model (described in detail in Section 4.4.2.2.5).

4.4.2.2.2 Soil Types

The majority of soil types in the proposed and connected project areas have developed from weathered sedimentary rock, with a few soils underlain by igneous rock. Bedrock is found at the surface in some areas but is generally found between 12 and 48 inches below the surface. The project areas are predominantly on hillsides and near the tops of ridges where the erosion hazard is characterized as moderate to very high because of the shallow soils, steep slopes, and rapid runoff (USDA 1966, 1977, 1981). Most soils are characterized as well drained to excessively drained (meaning runoff is high) because of the steep slopes. Soil textures vary but are generally characterized as clay loams, silt loams, and loams. The soils generally have good vegetative cover, including a mix of grasses, forbs, shrubs, trees, and leaf litter. Percent slope in the proposed and connected project areas, expressed as vertical rise over horizontal distance, ranges from zero (flat) to more than 200% (a 63° angle).[1] Organic matter in the surface layer ranges between 1 and 6%.

As described in the Soil Survey of Contra Costa County (USDA 1977) and the Soil Survey of the Alameda Area (USDA 1966), major soil associations[2] in the proposed and connected project areas consist of the following:

- **Los Osos-Millsholm-Los Gatos association:** These soils are located in the vicinity of El Sobrante and San Pablo Reservoir and are characterized by moderately steep to very steep, well-drained clay loams and loams that formed in material weathered from interbedded sedimentary rock on uplands.
- **Joice-Reyes association:** These soils are located at the Miller/Knox Regional Shoreline and are characterized by nearly level, very poorly drained, saline mucks and silty clays on saltwater marshes and tidal flats.
- **Clear Lake-Cropley association:** These soils are also located at the Miller/Knox Regional Shoreline and are nearly level to gently sloping, poorly drained and moderately well-drained clays on valley fill and in coastal valley basins.
- **Capay-Rincon association:** These soils are located in the western section of Miller/Knox Regional Shoreline and are nearly level to strongly sloping, moderately well-drained and well-drained clays and clay loams on valley fill.
- **Gillroy-Vallecitos association:** These soils are located along the remainder of the western Contra Costa County border with Alameda County and are characterized by moderately steep to very steep, well-drained clay loams and loams that formed in material weathered from basic igneous rock and metasedimentary rock on uplands.

[1] A 17° angle corresponds to a 30% slope, and a 45° angle corresponds to a 100% slope

[2] A soil association is defined as a group of soil types. This is a generalized description for general planning purposes.

- **Millsholm-Los Gatos-Los Osos association:** These soils are located around Lake Chabot Regional Park and Anthony Chabot Regional Park and are classified as moderately sloping to very steep, brownish soils on moderately hard sedimentary rocks.

These soil associations can be further divided into specific soil series and categorized according to physical and chemical properties. Nineteen specific soil series within these soil associations are mapped in the proposed and connected project areas, seven of which[3] when combined cover less than 1% of the proposed and connected project areas and therefore would not be discussed further. The remaining 12 soil types that individually comprise at least 1% of the project areas are shown in Table 4.4-3 along with the pH of the surface layer and percent organic matter.

Table 4.4-3. Soil Types Covering More Than 1% of Proposed and Connected Project Areas

Soil Type	Percent of Action Areas (1)(2)	Percent Organic Matter(3)	pH(4)
Los Osos Clay Loam	2.1	2–4	6.5
Los Gatos-Los Osos Complex	1.7	1–6	7.0
Maymen-Los Gatos Complex	8	<1–6	5.1 – 7.3
Millsholm Silt Loam	14.6	1–3	5.8
Los Osos and Millsholm Soils	16.7	1–4	5.8
Millsholm Loam	16.5	1–3	5.8
Maymen Loam	15.3	<2.5	5.1 – 5.5
Tierra Loam	2	3	5.6
Gilroy Clay Loam	20.6	2–6	6.3
Garretson Loam	0.5	1.25	6.7
Gaviota Rocky Sandy Loam	1	0.75	6.3
Xerorthents-Millsholm Complex	1	0.75	6.7

Sources: USDA 1966; USDA 1977; USDA 1981; USDA 2008a, 2008b, 2010a, 2010b.

(1) Based on total project acreage of approximately 2,057 acres.

(2) The nine soil types not listed in this table comprise 2.6% of the proposed and connected project areas combined; the nine soil types listed in the table comprise 97.4% of the proposed and connected project areas.

(3) Surface layer only

(4) Surface layer only

Figures 4.4-2a through 4.4-2d depict the soil types and surface soil textures in the proposed and connected project areas.

[3] Soil types covering less than 1% of the proposed and connected project areas: Felton loam, Cut and fill land-Millsholm complex, Zamora silty clay loam, Los Osos-Millsholm complex, Gaviota-Rock outcrop complex, Rock outcrop-Xerorthents association, and Urban land-Tierra complex.

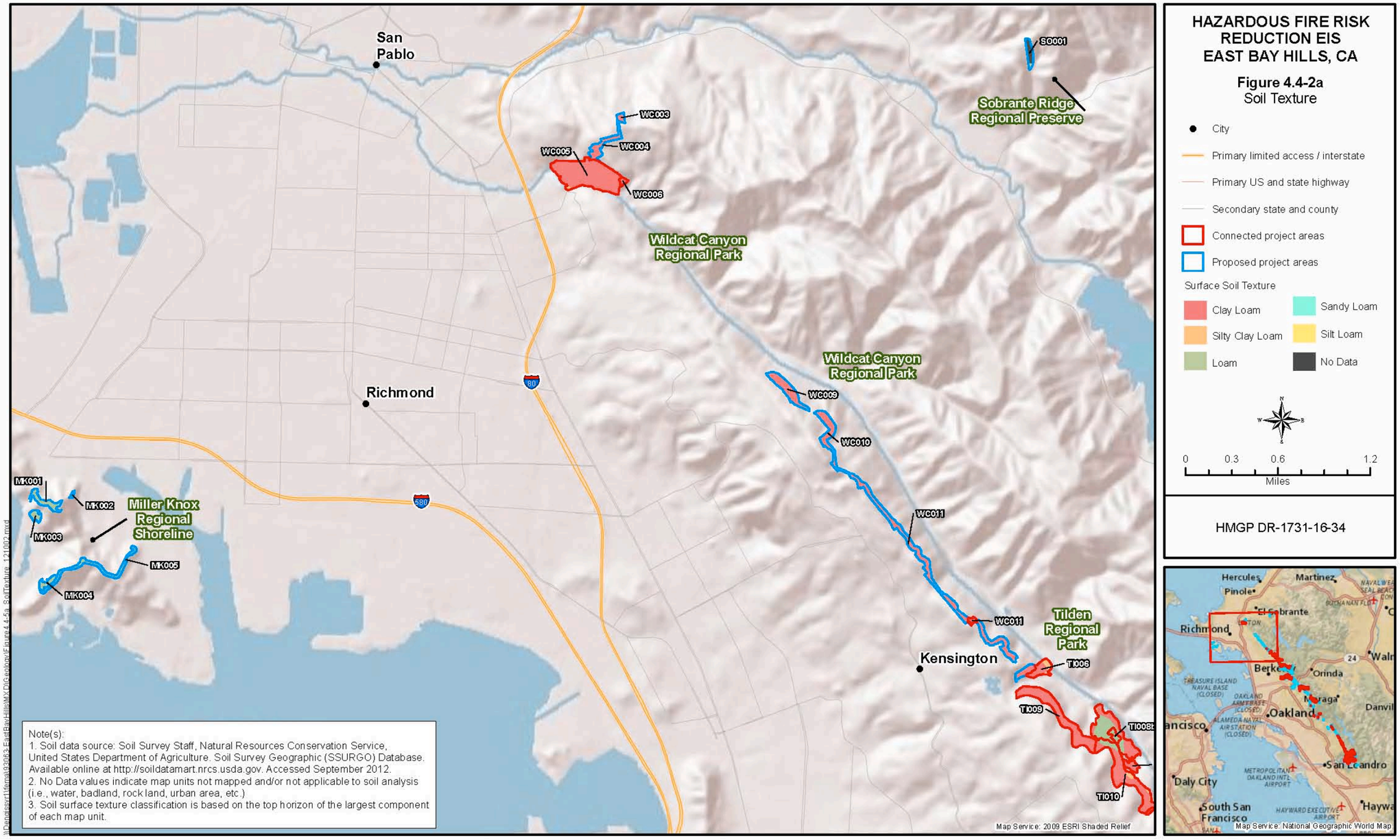

Figure 4.4-2a. Soil Texture

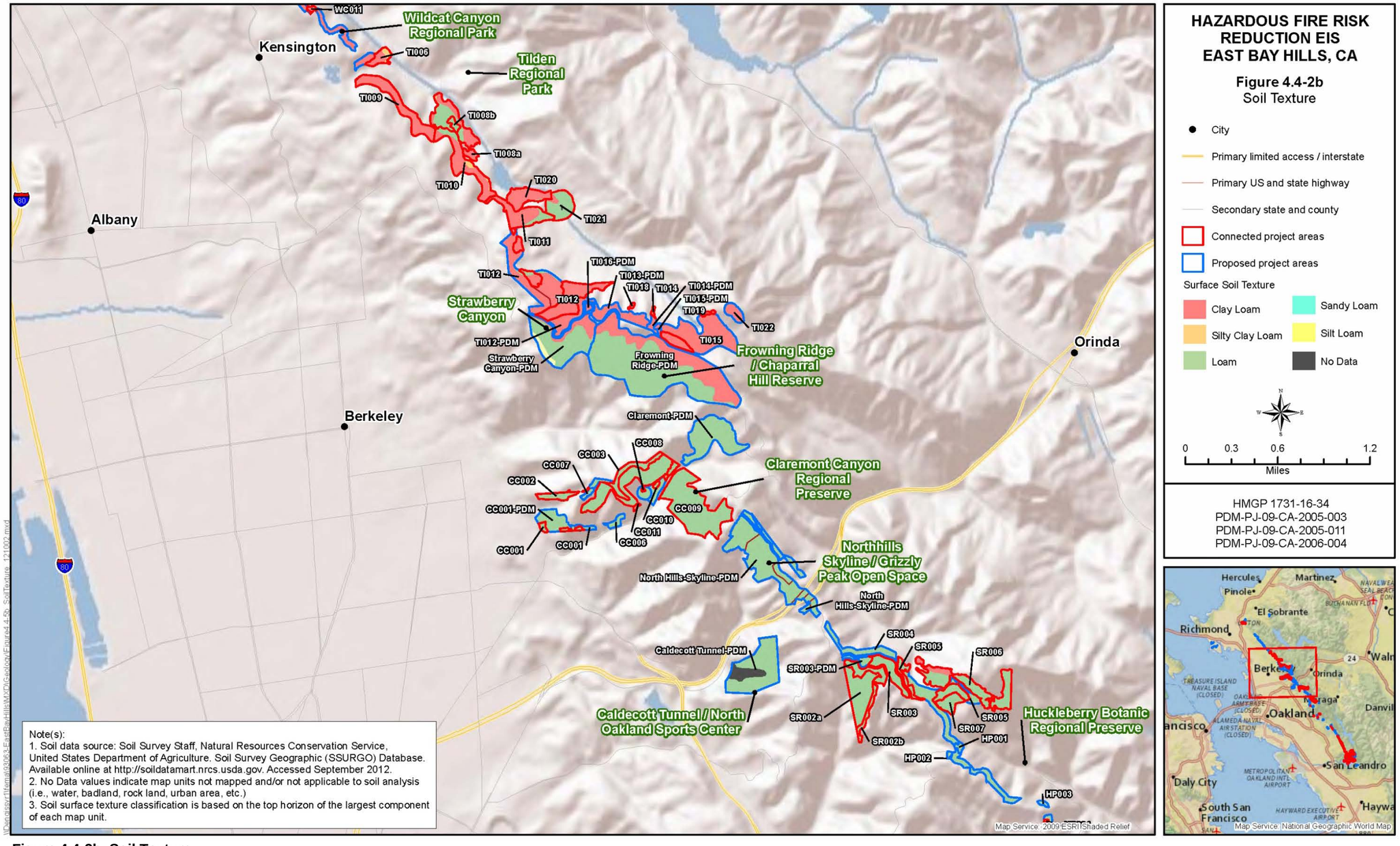

Figure 4.4-2b. Soil Texture

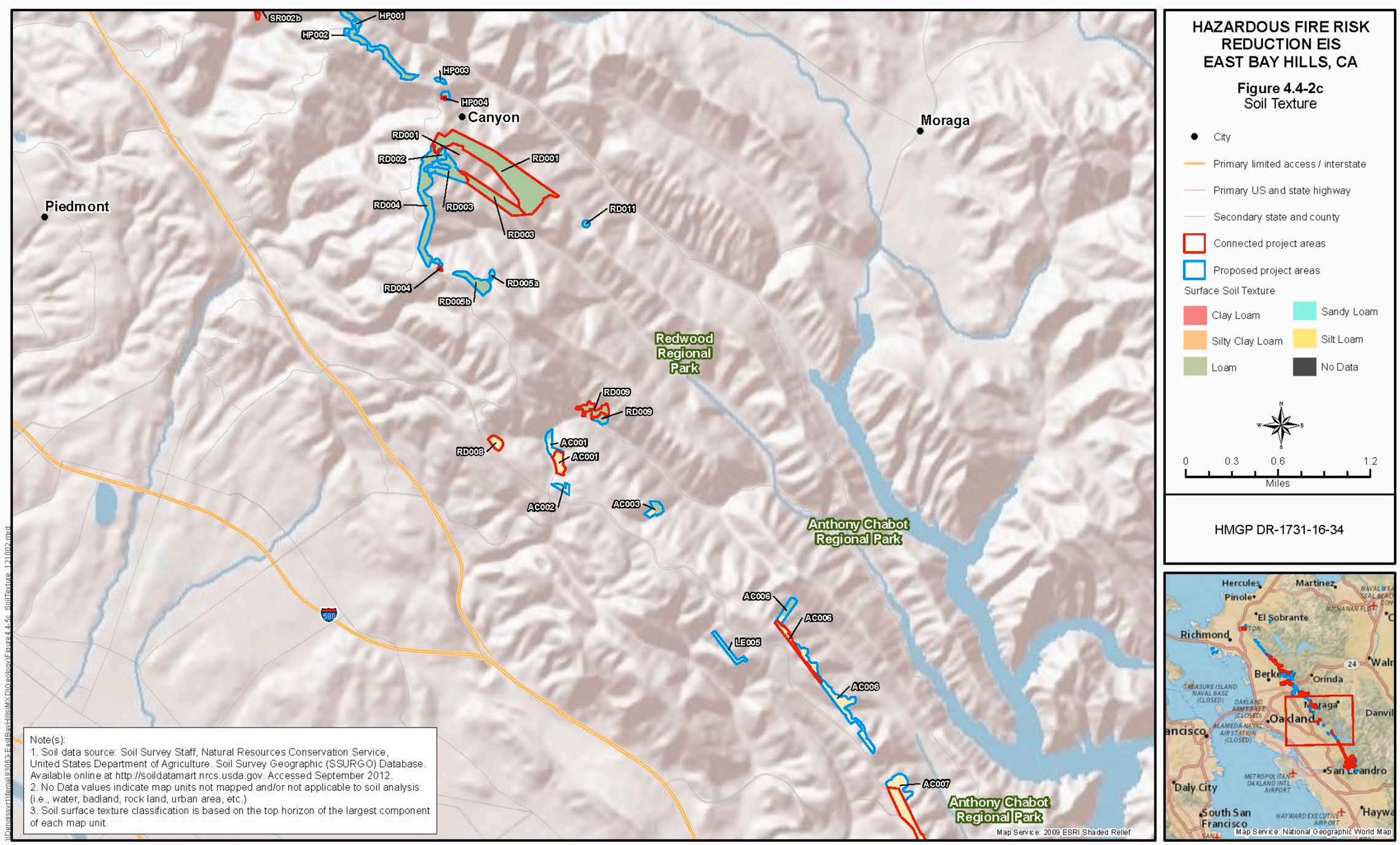

Figure 4.4-2c. Soil Texture

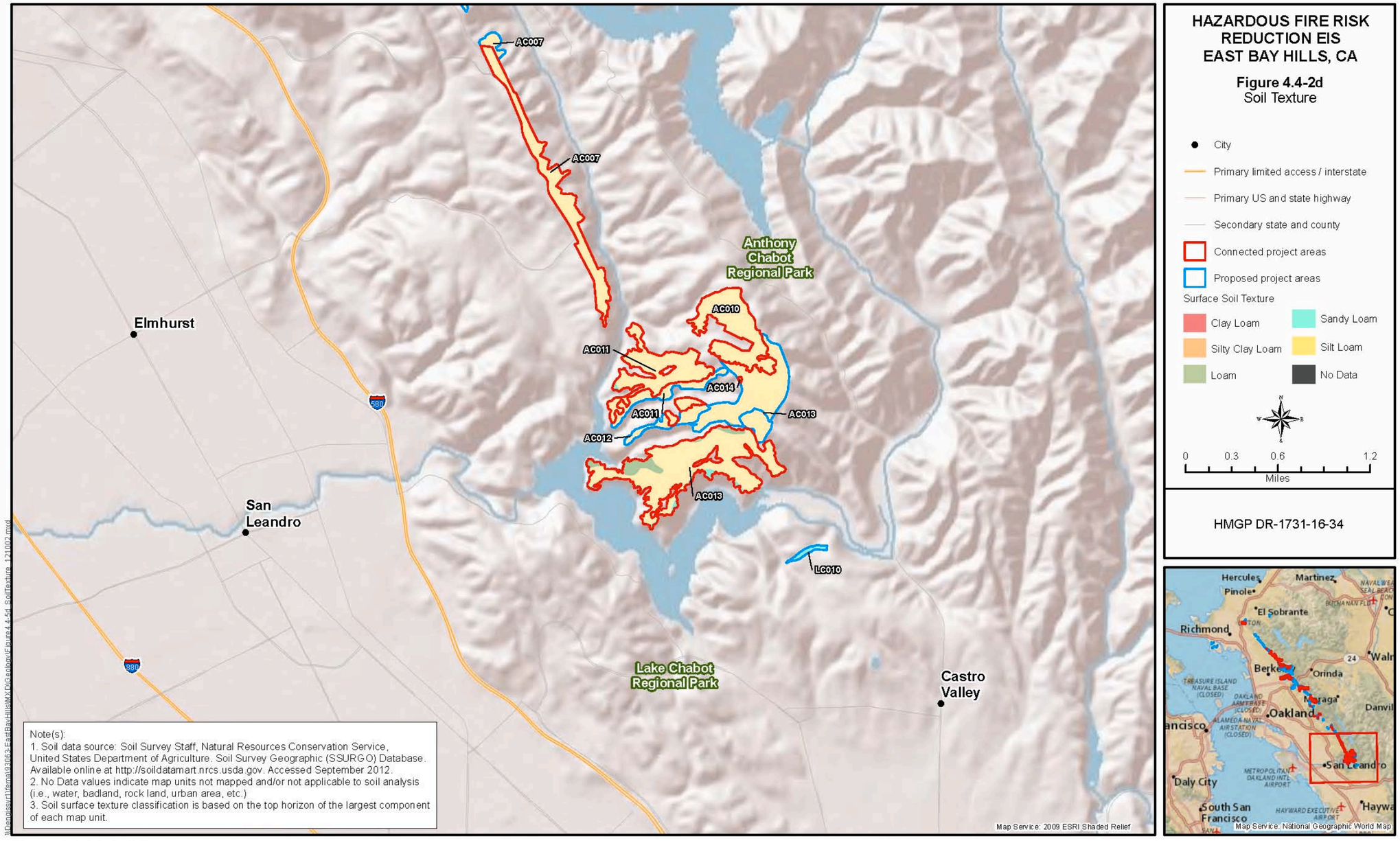

Figure 4.4-2d. Soil Texture

4.4.2.2.3 Shrink-Swell (Expansivity)

Expansive soils are soils with the potential to experience considerable changes in volume, either shrinking or swelling, due to changes in moisture content. Therefore, the expansive nature of soils is characterized by their shrink-swell capacity. Changes in soil volume are often expressed as a percent, and in soil surveys the percent represents the overall change for the whole soil.

Soils composed primarily of sand and gravel are not considered expansive (i.e., the soil volume does not change with a change in moisture content). Soils containing silts and clays may possess expansive characteristics. The magnitude of shrink-swell capacity in expansive soils is influenced by:

- Amount of expansive silt or clay in the soil
- Thickness of the expansive soil zone
- Thickness of the active zone (depth at which the soils are not affected by dry or wet conditions)
- Climate (variations in soil moisture content as attributed to climatic or man-induced changes)

The lowland portions of Miller/Knox Regional Shoreline contain alluvium and bay mud that consist of rich clay soils with a moderate potential for expansion under changing conditions.

Changes of volume can occur when expansive soils undergo alternating cycles of wetting (swelling) and drying (shrinking). Much of the proposed and connected project areas are on steep slopes with shallow soils of types generally noted to have low shrink/swell potential (USDA 1981). Shrink-swell potential is important to consider in relation to potential impacts to buildings and roadways. This project would not create permanent roads or buildings; therefore, soil shrink-swell properties are not discussed further.

4.4.2.2.4 Soil Productivity

Coarse Woody Debris and Organic Matter

Soil productivity is a measure of the soil's ability to produce vegetation. Productivity of forest soils is based primarily on the amount of surface organic matter and coarse woody debris (defined as dead wood greater than 3 inches in diameter that has fallen onto the ground). Deeper soils are generally more productive than shallower soils. Table 4.4-3 summarizes the percent organic matter for the surface layer of the dominant soils in the proposed and connected project areas.

The effects of management activities on soil productivity depend on the amount of coarse wood debris and surface organic matter retained or removed. Decaying wood on the forest floor is critical for maintaining a soil's ability to retain moisture and provide both short- and long-term nutrient supplies and habitat for microorganisms. Mycorrhizal fungi and other soil organisms depend on continuing input of woody debris and fine organic matter. Surface litter also retains

moisture. Generally, adequate amounts of coarse woody debris and surface litter are currently present to protect mineral soil from erosion and maintain soil productivity in most of the proposed and connected project areas. In many project areas where wildfires have not occurred in recent years, fire suppression has resulted in vegetation conditions with organic matter in excess of historical pre-settlement conditions, resulting in higher levels of coarse woody debris and surface litter than prior to fire suppression.

4.4.2.2.5 Soil Erosion

Soil erosion can occur due to wind blowing over erodible and smooth soils or by water eroding soil from sheet, rill, or gully action. In the proposed and connected project areas, soil erosion from water could result in loss of topsoil and water quality effects (discussed in Section 5.4, Water Resources). Water erosion is defined as the detachment and removal of soil material by water. The major factors that influence soil erosion are soil properties, slope, and climate. In turn, these factors determine the ability of the soils to support vegetation. Erosion from water occurs when plant cover is depleted, the spaces between plants become larger, and soil structure is degraded by disturbance or less input of organic matter. Soil compaction also increases runoff and the risk of accelerated erosion. Runoff that occurs in the vicinity of poorly designed roads or trails can also result in erosion on adjacent slopes and in roadbeds (USDA 2004).

The three processes of water erosion include sheet erosion (removal of soil more or less uniformly in a thin layer), rill formation, and gully erosion. Rill and gully erosion occurs when water runoff cuts channels into the soil (USDA 2004). Rills are narrow, shallow channels, and gullies are wider and deeper. Loss of surface soil caused by erosion reduces the supply of organic matter and plant nutrients and makes the soil less absorbent, leading to increased runoff and further erosion.

Erosion potential is the amount of soil that may erode from a given area and is typically expressed as an annual quantity. Erosion potential does not indicate the amount of sediment that actually reaches a nearby water body, which is referred to as sediment delivery. Although it is a natural process, erosion can cause detrimental impacts to surrounding watersheds through increased sediment delivery.

Water Erosion Prediction Project (WEPP) Model

To measure existing and potential future soil erosion for the proposed and connected project areas, a United States Forestry Service (USFS) model was used. The USFS has developed a computer model to assist with analyses of soil erosion rates associated with fuel management activities (USFS 2011). The model uses the Water Erosion Prediction Project (WEPP) Fuel Management Erosion Analysis (FuME) to estimate background erosion rates and predict erosion associated with mechanical thinning and prescribed fire. Model inputs include data regarding climate, vegetation, soil properties, and slope length and shape. The model's databases for disturbed forested hillslopes are based on rainfall simulation and natural rainfall studies carried out over 20 years (Elliot and Hall 1997). The WEPP FuME model is used to evaluate erosion on a single strip of hillslope. In the year of a disturbance (e.g., a wildfire or mechanical thinning), there is likely to be erosion from the disturbed hillslope and a potential for sediment delivery into the stream network compared to conditions prior to the disturbance. The model calculates the amount of sediment dislodged from a hillslope and *available* for delivery to a stream or water

body not the *actual* amount of sediment delivered, which depends primarily on the position of the hillslope on the landscape. For example, an acre of hillslope that is close to a ridgeline would have a much lower amount of sediment delivery than an acre of hillslope with a stream immediately below it. The sediment on the higher hillslope may eventually work its way down to the stream, but most of the sediment is likely to be deposited in that same acre of hillslope or on the landscape immediately below. As the disturbed hillslope recovers, the amount of erosion from it would gradually decline.

Model Description and Inputs - Existing conditions were modeled as a baseline for comparison to disturbed conditions, which are presented in Section 5.3.2. Seven locations representative of the soil conditions and slopes in the proposed and connected project areas were chosen for WEPP FuME modeling (Table 4.4-4, Figures 4.4-2a through 4.4-2d). The modeling locations provide a range of soil type, slope percent, vegetation, and vegetation management objectives.

Model inputs include climate (always selected as Newark, California[4]), soil texture (varied based on soil type), road density (selected as 1 mile of roads per square mile based on review of aerial photography and road density, including hiking trails, existing roads, and old/abandoned roads, such as skid trails), hillslope horizontal length, and buffer width (500 feet and 10 feet, respectively[5]), hillslope gradient (variable based on geographic information systems [GIS] digital elevation model), and disturbance return period for wildfire, prescribed fire, and thinning. Because of fire exclusion and the low probability that prescribed fire would be implemented in the project area considering the safety risk and the fact that prescribed fire is not eligible for FEMA funding, a recurrence interval of 100 years was selected for the recurrence of wildfire and prescribed fire.

The 100-year recurrence interval for wildfire represents a worst-case scenario if a wildfire occurred. The longer the recurrence interval, the more intense the fire is likely to be, based on a build-up of fuels. Because the thinning recurrence interval is a required model input, it was assumed that thinning would be conducted approximately every 20 years. In the model interface, hillslope gradient must be entered between 0 and 90%; therefore, in areas where the digital elevation model indicated slopes greater than 90%, the 90% value was used.

Because the FuME model determines undisturbed forest conditions (existing or baseline conditions) while concurrently calculating sediment delivery for the proposed and connected actions (disturbed conditions), the model was run using all inputs (including disturbance return periods) described above to obtain background erosion rates.

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[4] The climate location must be chosen from a list in the WEPP FuME model. Newark, California is the closest location to the project area available for selection.

[5] A 500-foot slope length was chosen based on areas within the proposed and connected project areas. Typically, slope length is interrupted by changes in topography, and this was a conservative (i.e., large) distance chosen for modeling erosion. The 10-foot buffer represents vegetation between the base of a slope and a stream that tends to capture sediment being transported in water across the landscape.

Table 4.4-4. Selected Locations for WEPP Erosion Modeling

Site ID	Soil Type	Surface Texture	Vegetation Type[1]	Percent Slope[2]	Project Area[3]
1	Millsholm Loam	Loam	coniferous pine forest/ plantation	77%	MK001
2	Gilroy Clay Loam	Clay loam	coastal scrub (xeric)	97%	WC009
3	Maymen Loam	Loam	eucalyptus forest/ plantation	103%	Strawberry Canyon-PDM
4	Xerorthents-Millshlom Complex	Silt loam	developed/disturbed/ landscaped	163%	Caldecott Tunnel-PDM
5	Los Gatos-Los Osos Complex	Loam	oak-bay woodland/forest	155%	Near AC003
6	Los Osos and Millsholm	Silt loam	California annual grassland	66%	Near LC010
7	Los Osos and Millsholm	Silt loam	coyote brush scrub	5%	AC014

[1] Information on vegetation type is based on GIS data (EBRPD 2006), field reconnaissance, and aerial photography
[2] Percent slope is based on a National Elevation Dataset (USDA 2010c)
[3] Corresponds with the identification numbers shown on Figure 4.4-3.

Results of the WEPP FuME modeling for existing conditions are shown in Table 4.4-5. It is assumed that the sediment generated from hillslope disturbances would be routed primarily through the watershed during years with intense storms (i.e., the 10-year storm event and greater) or larger total amounts of precipitation than an average year. The model calculates erosion rates based on a return period analysis that incorporates storm intensity and the number of storms based on 50 years of climate data from Newark, California. The results shown in Table 4.4-5 are for the 2.5-year return period, which represents the total annual rainfall that has a 40% chance of occurring in any given year, and the 50-year return period, which is the annual rainfall that has a 2% chance of occurring in any given year.

Table 4.4-5. Average Annual Erosion for Existing Conditions Based on WEPP Modeling

Site ID	Average Annual Sediment (tons/acre/year)		
	Project Area[3]	2.5-Year Recurrence Interval[1]	50-Year Recurrence Interval[2]
1	MK001	0.11	2.31
2	WC009	0.02	3.24
3	Strawberry Canyon-PDM	0.12	2.48
4	Caldecott Tunnel-PDM	0.07	4.42
5	Near AC003	0.12	2.48
6	Near LC010	0.06	4.02
7	AC014	0.00	0.38

WEPP = Water Erosion Prediction Project
[1] Calculated in the WEPP model based on Newark, California, climate and is equal to 16.02 inches of precipitation in 1 year
[2] Calculated in the WEPP model based on Newark, California, climate and is equal to 24.11 inches of precipitation in 1 year

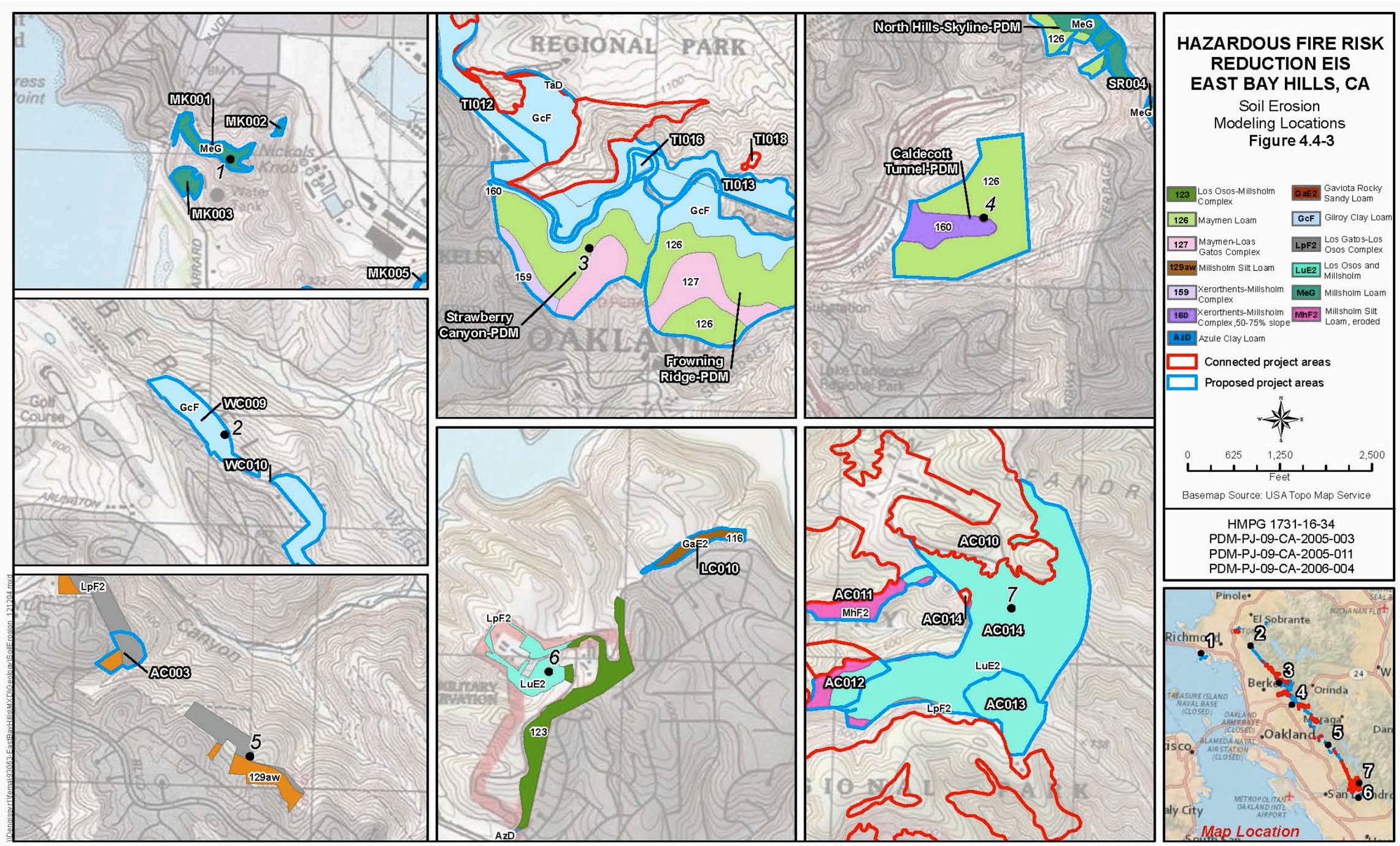

Figure 4.4-3. Soil Erosion Modeling Locations

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On undisturbed sites, surface erosion occurs at relatively low natural rates (less than 1 ton per acre) because soils are protected by vegetation and layers of organic litter. Accelerated surface erosion is usually associated with disturbances that reduce vegetative cover, displace organic surface layers, or reduce soil porosity through compaction.

There is currently minor evidence of surface erosion at various locations in the proposed and connected project areas, primarily from storm water runoff concentrated by roads and development. Because wildfire has been suppressed in the proposed and connected project areas in recent years, there is currently no evidence of severely burned soil that does not support vegetation. Enough time has passed since previous wildfires (15 fires between 1923 and 1992) that the recovery of native and non-native vegetation and forest litter are providing adequate ground cover protection for soils.

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4.5 Water Resources

Water resources in the proposed and connected project areas consist of surface water and groundwater. Surface waters in the region consist of non-tidal wetlands, rivers, streams, and lakes (collectively described as inland surface waters), estuarine wetlands, estuarine waters, and coastal waters. Wetlands are discussed further in Section 4.2.2.4 of this EIS. However, surface water in the proposed and connected project areas is composed predominately of urban and natural creeks that drain to San Francisco Bay. Groundwater is under the ground surface in soil and fractures in rock formations and is an important component of the hydrologic system in the San Francisco Bay region.

Surface water and groundwater quality can be adversely impacted by point and nonpoint sources of pollution. Point sources are those that meet the legal definition provided in section 502(14) of the Clean Water Act (CWA). As defined in the CWA, "point source means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural stormwater discharges and return flows from irrigated agriculture." In contrast, nonpoint sources, which have been reported to be the leading cause of water quality impacts, are not easily discernable and can result from rain or snow melt carrying various sources of pollution over or beneath the land until it is deposited, discharged, or leached to surface water and groundwater resources. Sources of nonpoint pollution can include herbicide application and excess sediment loading due to erosion (EPA 2012f).

4.5.1 Regulatory Setting

4.5.1.1 Federal

The CWA (33 U.S.C. §§ 1251 et seq.) is the primary federal law protecting the quality of the nation's waters, including lakes, rivers, coastal wetlands, and groundwater. The primary objective of the CWA is to maintain or improve the nation's water quality, in part, by reducing or preventing discharges of both point and nonpoint sources of pollution. The primary principle is that any pollutant discharge into the nation's waters is prohibited unless specifically authorized by a permit; permit review is the CWA's primary regulatory tool. Several sections of the CWA apply to this project: Section 303 (Water Quality Standards and Implementation Plans), Section 401 (Water Quality Certification), Section 402 (National Pollutant Discharge Elimination System), and Section 404 (regulation of discharges of dredge or fill material into waters of the United States, including wetlands).

4.5.1.1.1 Section 303 of the CWA

Section 303 of the CWA requires states to adopt water quality standards for all surface and groundwater of the United States. When multiple uses exist (e.g., agricultural supply, municipal supply, recreation, and preservation of rare and endangered species), water quality standards must protect the most sensitive use. The State Water Resources Control Board (SWRCB) administers water rights, water pollution control, and water quality functions for the state as part of the California Environmental Protection Agency (Cal/EPA). It provides policy guidance and

budgetary authority to the Regional Water Boards, which conduct planning, permitting, and enforcement activities. The SWRCB shares authority for implementation of the federal CWA and the state Porter-Cologne Act with the Regional Water Boards. The San Francisco Bay Regional Water Quality Control Board (SFRWQCB) regulates surface water and groundwater quality in the proposed and connected project areas. Section 303(d) of the CWA requires states to identify water bodies that are not attaining water quality standards and to establish total maximum daily loads (TMDLs) for pollutants causing the impairment (nonattainment of water quality standards) of listed water bodies.

4.5.1.1.2 Section 402 of the CWA

Section 402 of the CWA requires that all municipal, industrial, and commercial facilities that discharge wastewater or stormwater directly from a point source (a discrete conveyance, such as a pipe, ditch, or channel) into a water of the United States (such as a lake, river, or ocean) must obtain a NPDES permit. The NPDES permit process also provides a regulatory mechanism for the control of nonpoint source pollution created by runoff from construction and industrial activities and general and urban land use, including runoff from streets. All permits are written to ensure the receiving waters would achieve applicable water quality standards. Dischargers whose projects disturb 1 or more acres of soil or whose projects disturb less than 1 acre but are part of a larger common plan of development that in total disturbs 1 or more acres are required to obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity, Construction General Permit Order 2009-0009-DWQ. In California, the SWRCB and RWQCBs are responsible for the implementation of the NPDES permitting process at the state and regional levels, respectively. Projects involving construction activities (e.g., clearing, grading, or excavation) involving land disturbance greater than 1 acre must file a Notice of Intent with the applicable Regional Water Quality Control Boards (RWQCB) to indicate their intent to comply with the State General Permit for Stormwater Discharges Associated with Construction Activity (General Permit). The General Permit establishes conditions to minimize sediment and pollutant loadings and requires preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) prior to construction. The SWPPP is intended to help identify the sources of sediment and other pollutants and to establish best management practices for stormwater and non-stormwater source control and pollutant control as well as address emergency protocols in the event of fuel spills or other accidents that could occur during construction.

4.5.1.1.3 Sections 401 and 404 of the CWA

The U.S. Army Corps of Engineers (USACE) issues federal permits for dredging or placement of fill in waters of the U.S. pursuant to Section 404 of the CWA. EPA provides oversight of the USACE regulatory program. As part of the Section 404 permitting process, the permit applicant must also seek water quality certification from the State of California in accordance with Section 401 of the CWA. The proposed and connected actions would not include dredging or placement of fill in waters of the U.S. and would not require a permit under Section 404 or certification under Section 401.

4.5.1.1.4 Executive Order 11988

Executive Order 11988, Floodplain Management (44 CFR § 9), requires federal agencies to take action to minimize occupancy and modification of the floodplain. Specifically, Executive Order 11988 prohibits federal agencies from funding activities that have an adverse effect on the 100-year floodplain unless there is no practicable alternative.

4.5.1.2 State

The SWRCB regulates water quality and water pollution control for California as part of Cal/EPA. The approach to improving water quality includes identifying and reducing or managing both point sources and nonpoint sources of pollution from runoff within an entire watershed. SFRWQCB regulates surface water and groundwater quality in the proposed and connected project areas. *The Water Quality Control Plan for the San Francisco Bay Basin* (Basin Plan) (SFRWQCB 2011), developed by the SFRWQCB and approved by the State Water Resources Control Board and EPA, establishes water quality objectives and implementation programs to meet stated objectives and to protect the beneficial uses of surface water and groundwater in the San Francisco Bay drainage basin as described below. All discharges to surface water or groundwater are subject to the Basin Plan requirements (SFRWQCB 2011).

Rain transports pollutants and sediment from urban areas to surface water via the stormwater drainage system, which can increase the load of suspended solids (sediment) and herbicides in the water and impair water quality in the region. Therefore, the Basin Plan includes an urban runoff management program, with the objective of reducing the transport of pollution to surface water bodies from the stormwater drainage system. Within the management program is a comprehensive control program implemented by issuing NPDES permits to improve existing water quality and to prevent additional inputs that would further degrade surface water quality from stormwater discharge. Included in the program is the objective to develop and implement strategies to reduce runoff associated with herbicide application in the region. Since runoff to the storm drain system includes runoff from roads, the urban runoff management program also includes a highway runoff management control program, which includes management of herbicide use, to be implemented by the California Department of Transportation (Caltrans) (SFRWQCB 2011).

4.5.1.2.1 Beneficial Uses of Receiving Waters

Beneficial uses of receiving waters define the resources, services, and qualities of aquatic systems that are the ultimate goals of protecting and achieving high water quality. The Basin Plan designates the beneficial uses of local receiving waters, sets forth water quality objectives to protect and enhance these beneficial uses, and formulates water management programs that limit discharges to these receiving water bodies. The water quality objectives apply to all surface water and groundwater in the San Francisco Bay drainage basin.

The beneficial uses of each significant water body in the region are listed in the Basin Plan, Table 2-1 (Existing and Potential Beneficial Uses of Water Bodies in the San Francisco Bay Region), which is provided in Appendix C, Table 2-1. The beneficial uses include, but are not limited to, domestic, municipal, agricultural, and industrial supply, groundwater recharge, water contact recreation, noncontact water recreation, wildlife habitat, cold freshwater habitat, warm

freshwater habitat, fish migration, and fish spawning (SFRWQCB 2011). Protection and enhancement of existing and potential beneficial uses are the primary goals of water quality planning.

4.5.1.2.2 Water Quality Objectives

The Porter-Cologne Water Quality Control Act, California Water Code, Division 7 (Water Quality), defines water quality objectives as "...the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance in a specific area" (Water Code Section 13050(h)). It also requires that the RWQCBs establish water quality objectives while acknowledging that it is possible for water quality to be changed to some degree without unreasonably affecting beneficial uses.

The two types of objectives are narrative and numerical. Narrative objectives present general descriptions of water quality that must be attained through pollutant control measures and watershed management. They also serve as the basis for the development of detailed numerical objectives. Numerical objectives typically describe pollutant concentrations, physical/chemical conditions of the water itself, and the toxicity of the water to aquatic organisms. These objectives are designed to represent the maximum amount of pollutants that can remain in the water column without causing any adverse effect on organisms using the aquatic system as habitat, on people consuming those organisms or water, and on other current or potential beneficial uses. The SFRWQCB establishes and enforces waste discharge requirements for point and nonpoint source of pollutants at levels necessary to meet numerical and narrative water quality objectives.

When water quality is better than that prescribed by the objectives, the California Antidegradation Policy applies and is aimed at protecting relatively uncontaminated aquatic systems where they exist and preventing further degradation.

4.5.1.3 Local Policies, Ordinances, and Bans Associated with Herbicide Use and Water Quality

Herbicide use and erosion, which can lead to sedimentation and turbidity, have the potential to negatively impact water quality. In addition to the federal and state regulations pertaining to water quality described above, local policies, ordinances, and bans related to herbicide use have been implemented to protect water quality. In addition to subapplicant policies and programs, local policies, ordinances, and bans related to herbicide use and erosion are described in Section 4.5.2.2.2 and Section 4.5.2.2.3, respectively.

4.5.2 Surface Water

This section contains a discussion of the existing surface water in the proposed and connected project areas, including known surface water quality issues.

4.5.2.1 Methodology

This section presents the methodologies used in the analysis of existing conditions associated with surface water resources. In order to determine alternative-specific impacts to water resources, existing data on surface water resources, associated management practices, hydrology, and water quality were evaluated. Existing conditions were compared to the proposed and connected actions to determine what impacts could be reasonably expected from the implementation of the proposed and connected actions. The project elements, including the size and location of the project areas, the best management practices (BMPs) and avoidance measures, and the methods used to remove the vegetation, were analyzed for their potential impact to the individual project areas.

4.5.2.2 Existing Conditions

The following sections provide a description of the watersheds in the proposed and connected project areas. In addition, current management activities relative to surface water quality currently undertaken on lands operated and managed by each of the subapplicants are described below.

4.5.2.2.1 Hydrology

The East Bay Hills has a Mediterranean climate with rain falling primarily during the wet season from November to March, usually in short periods of heavy intensity. The East Bay Hills causes a rain-shadow effect, resulting in average annual rainfall levels that are highest just east of the crest of the Oakland-Berkeley Hills. Rainfall for Oakland and Berkeley is approximately between 23 and 25 inches in the hills (Western Regional Climate Center [WRCC] 2011b). Soil texture and depth affects infiltration of surface waters. Soils in the proposed and connected project areas contain clay, silt, sand, loam, and rock with varying grain sizes and content. The soil types and consistencies vary by location (see Section 4.4).

Watersheds

The proposed and connected project areas are drained through both surface and subsurface drainages by six major watersheds that have headwaters originating within the East Bay Hills (Figure 4.5-1a to 4.5-1f).These larger watersheds contain smaller creeks and drainages, which define several of the project areas in this EIS. San Pablo and San Leandro Creek watersheds are larger watersheds that drain the eastern side of the hills (Figures 4.5-1b, 4.5-1e, and 4.5-1f); the Pinole Creek – Frontal San Pablo Bay Estuaries watershed contains Wildcat Creek and Lake Anza (Figures 4.5-1b and 4.5-1c); Codornices (Figure 4.5-1c), Strawberry (Figure 4.5-1c), Temescal (Figure 4.5-1d), and Sausal Creek (Figure 4.5-1d) watersheds drain the western side of the hills and are part of the Cerrito Creek- Frontal San Francisco Bay Estuaries watershed (Figures 4.5-1b to 4.5-1f). Additional portions of the proposed and connected project areas are drained by the Point Richmond Peninsula West and Harbor Channel watersheds. Table 4.5-1 shows the drainage area for each watershed and the area of the proposed and connected actions within each watershed. Table 4.5-2 provides the name and identifier for each area by watershed.

Angel Island – San Francisco Bay Estuaries

The Angel Island – San Francisco Bay Estuaries watershed contains much of the bay front areas that drain directly to the San Francisco Bay. Point Richmond is located within this larger watershed designation and has five project areas located on it (Table 4.5-2.These bay front areas are generally more urban than the eastern slopes containing the proposed and connected project areas. The creeks in these areas primarily drain urban areas and in many cases run underground through culverts.

Point Richmond Peninsula

The Point Richmond Peninsula is approximately 920 acres and includes a portion of the City of Richmond and the Potrero-San Pablo peninsula. No natural creeks are in this drainage area.

The proposed project areas in the Miller/Knox Regional Shoreline are on the Point Potrero peninsula. These proposed project areas comprise approximately 6% of the larger Angel Island – San Francisco Bay Estuary watershed (Table 4.5-2). Surface water from the proposed project areas (MK001, MK002, MK004) drains toward Point Richmond and San Francisco Bay (Figure 4.5-1a).

Harbor Channel

The Harbor Channel area is approximately 1,880 acres and includes west Richmond and a portion of the Potrero-San Pablo peninsula. No natural creeks remain in the west Richmond area. Flat areas in west Richmond are drained by culverts, storm drains, and engineered channels that do not reflect natural drainage patterns.

A small portion of the Miller/Knox Regional Shoreline proposed project areas is in the Harbor Channel area on the Point Potrero peninsula. These project areas comprise approximately 0.3% of the watershed (Table 4.5-2). Surface water from this portion of the project areas drains toward the Santa Fe Canal and Harbor Channel.

Cerrito Creek – Frontal San Pablo Bay Estuaries

This watershed drains San Pablo Creek and Wildcat Creek in the northern part of the project area (Figure 4.5-1b). Proposed project WC003 is the only proposed project that impinges on the San Pablo Creek (Figure 4.5-1b) although Wildcat Creek contains a number of project areas, especially in the southern, upstream portion of the creek (Figure 4.5-1c).

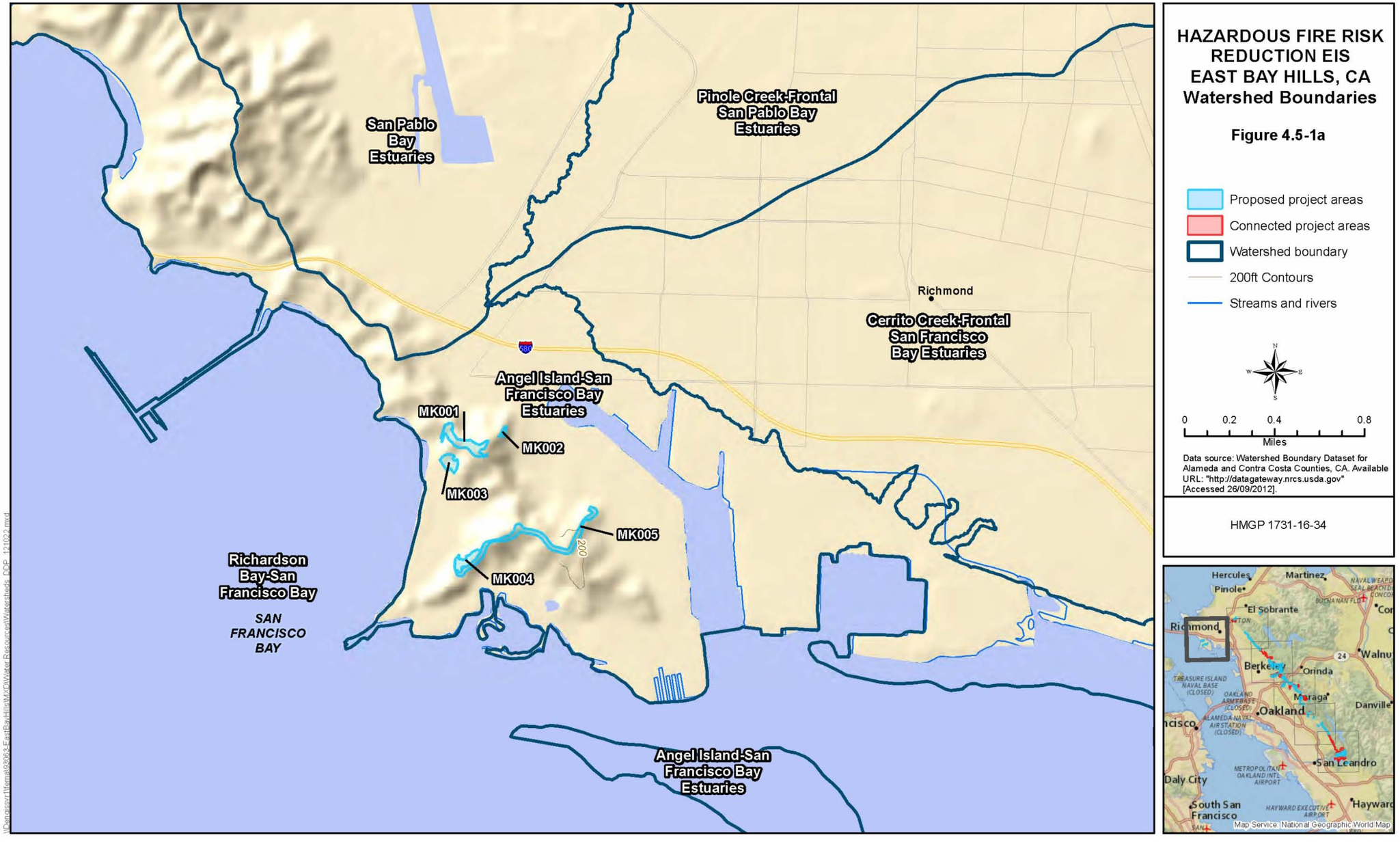

Figure 4.5-1a. Watershed Boundaries

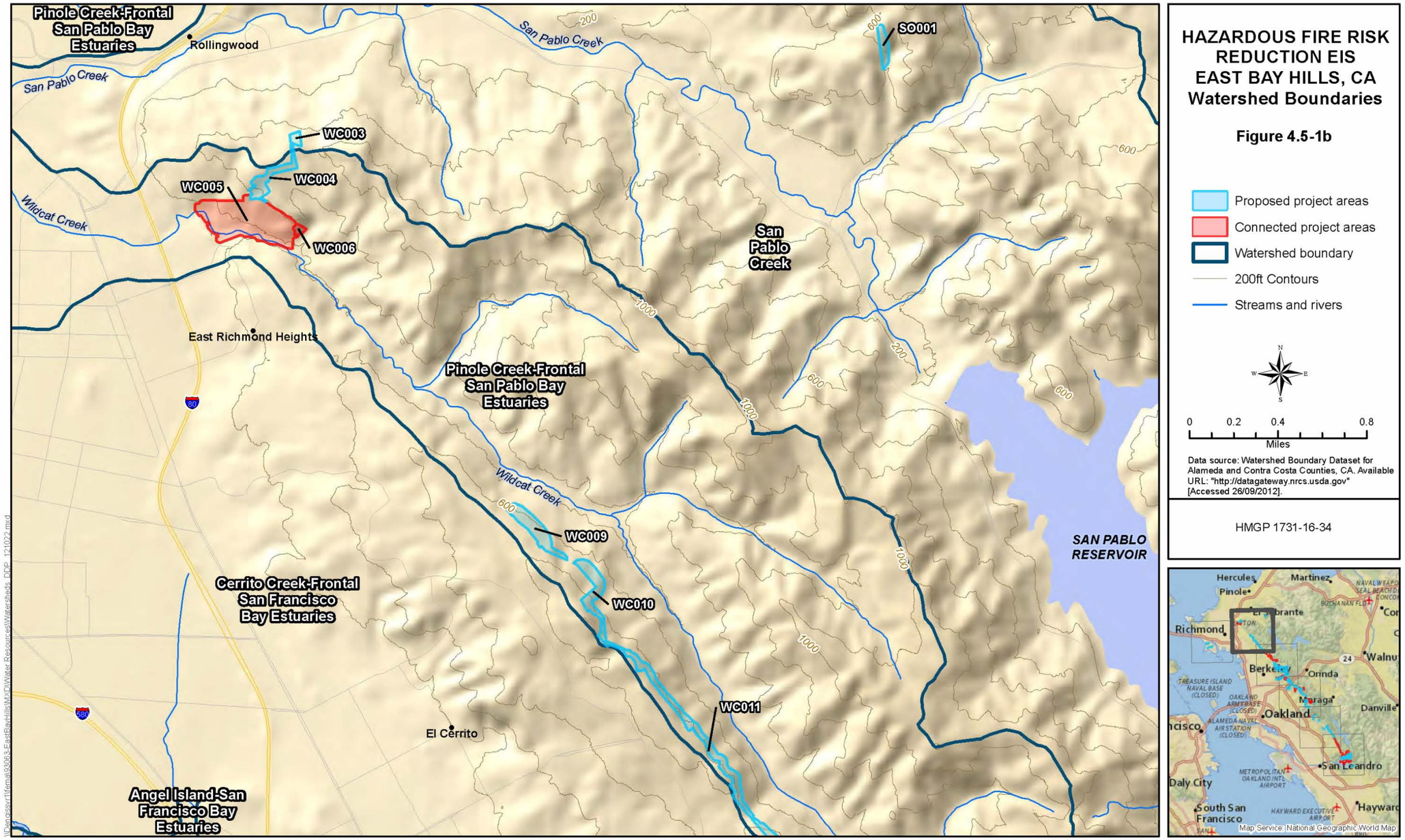

Figure 4.5-1b. Watershed Boundaries

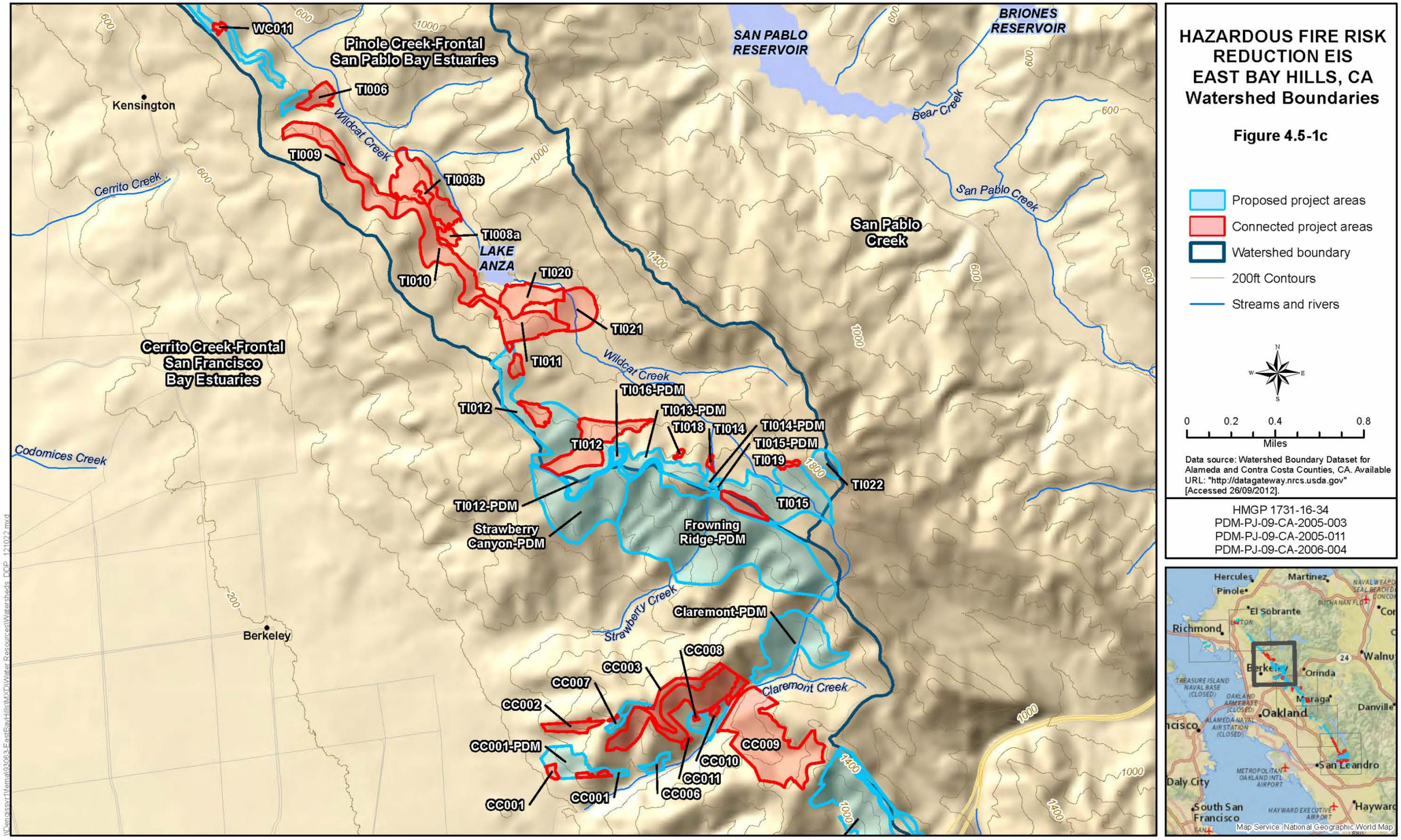

Figure 4.5-1c. Watershed Boundaries

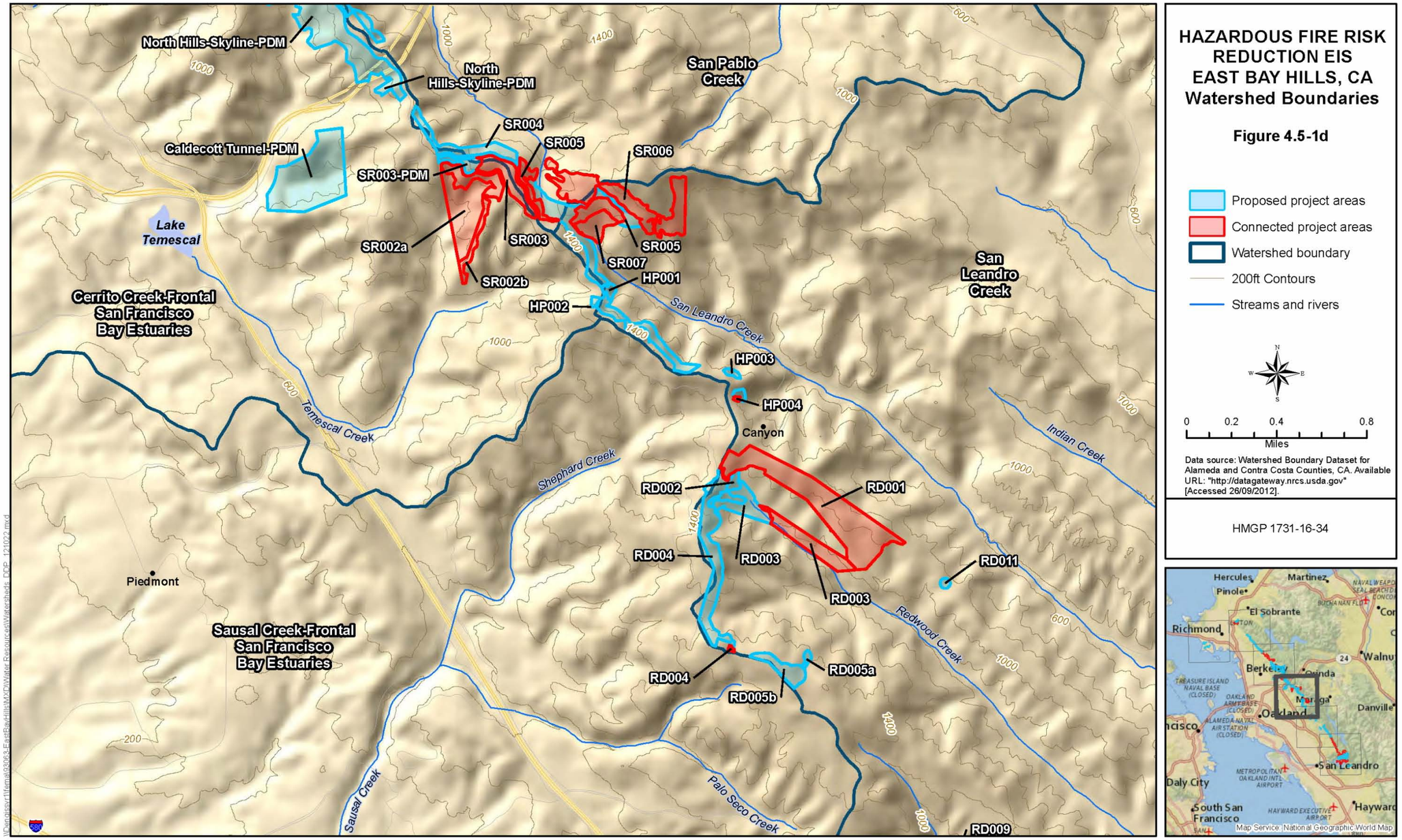

Figure 4.5-1d. Watershed Boundaries

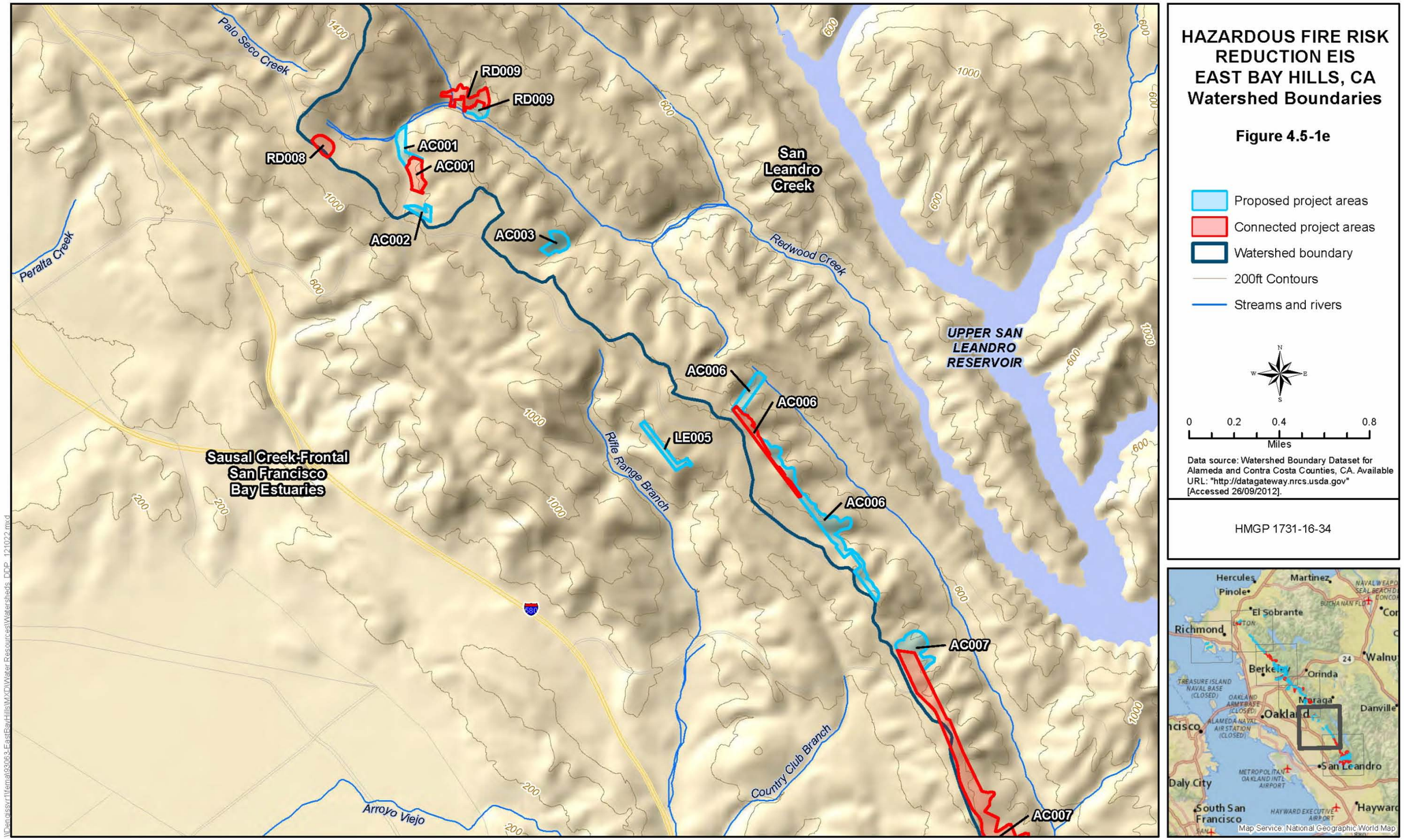

Figure 4.5-1e. Watershed Boundaries

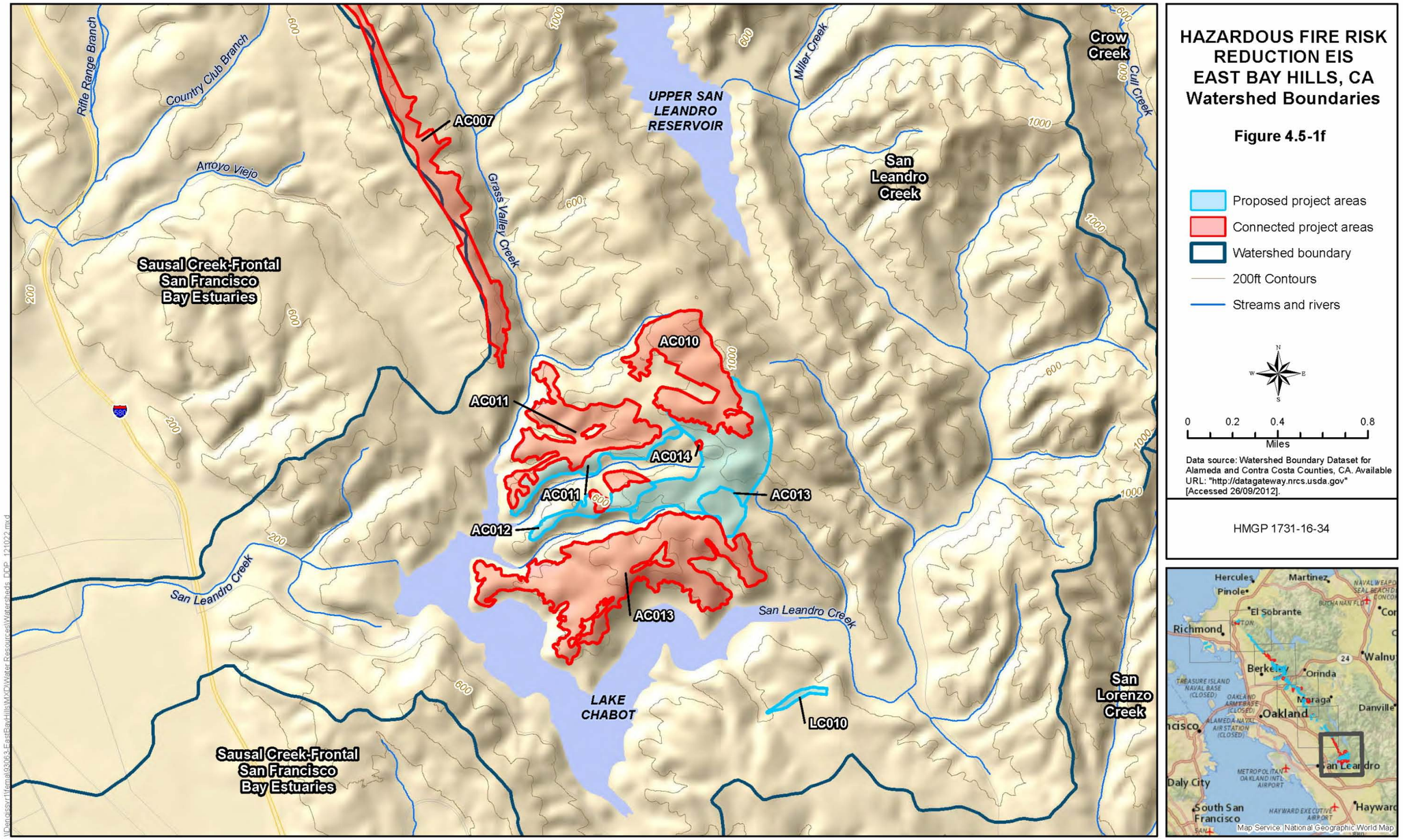

Figure 4.5-1f. Watershed Boundaries

Table 4.5-1. Watersheds Containing Proposed and Connected Project Areas

Watershed	Total Area (acres)	Proposed and Connected Project Areas (acres)	Proposed and Connected Project Areas as Percentage of Watershed
Angel Island – San Francisco Bay Estuaries	369.81	22.2	6.0
Pinole Creek – Frontal San Pablo Bay Estuaries	14267.94	418.6	2.9
San Pablo Creek	26101.51	58.7	.2
Cerrito Creek – Frontal San Francisco Bay Estuaries	21403.31	647.5	3.0
San Leandro Creek	29055.28	897.8	3.1
Sausal Creek – Frontal San Francisco Bay Estuaries	14688.36	14.1	.1
Total	**105886.21**	**2058.98**	**1.9**

Source: Sowers et al 2006, Sowers and Richard 2009, Sowers 2011

Table 4.5-2. Proposed and Connected Project Areas by Watershed

Watershed Name	Park or Other Location	Proposed and Connected Project Areas Included
Angel Island – San Francisco Bay Estuaries	Miller/Knox Regional Shoreline	MK001, MK002, MK003, MK004, MK005
Pinole Creek – Frontal San Pablo Bay Estuaries	Wildcat Canyon Regional Park, Sobrante Ridge Regional Preserve, Tilden Regional Park, Claremont Canyon Regional Preserve, Sibley Volcanic Regional Park, Wildcat Canyon, Frowning Ridge-PDM, Tilden-Oakland-PDM	WC003, WC004, WC005, WC009-WC011,SO001, TI006, TI012,TI015, TI022, CC012, SR001, SR004, SR005, Frowning Ridge-PDM, Tilden-Oakland-PDM
Cerrito Creek – Frontal San Francisco Bay Estuaries	Tilden, Frowning Ridge–Oakland-PDM, Strawberry Canyon-PDM, Tilden-Oakland-PDM, Claremont Canyon -PDM, Sibley, Huckleberry Botanic Regional Preserve, Claremont Canyon -Stonewall – PDM, Caldecott Tunnel-PDM, North Hills-Skyline-PDM,	TI012, TI012, TI015 Frowning Ridge- PDM, Strawberry Canyon-PDM, Claremont -PDM, CC001, CC003, CC006- CC008, CC010, CC012, SR001, SR004, SR005, HP001, HP002, Caldecott Tunnel-PDM, North Hills-Skyline-PDM,
San Leandro Creek	Sibley, Huckleberry, Redwood Regional Park, Anthony Chabot Regional Park, Lake Chabot Regional Park	SR005, HP001through HP004, RD001-RD005b, RD009, RD011, AC001- AC003, AC006, AC007, AC011through AC014, LC010
Sausal Creek – Frontal San Francisco Bay Estuaries	Redwood, Leona Canyon Regional Open Space	RD004, RD005b, LE005

Source: Sowers et al. 2006, Sowers and Richard 2009, Sowers 2011.

San Pablo Creek

San Pablo Creek drains approximately 26,160 acres. Perennial tributaries of San Pablo Creek include Bear Creek, which drains into San Pablo Reservoir, and Lauterwasser Creek, which drains into Briones Reservoir. Much of the upper reaches of the creek above the reservoirs has limited access and is protected by East Bay Municipal Utility District (EBMUD) or EBRPD. San Pablo Reservoir is used as water storage by the East Bay Municipal Utility District. Water supplies from the Mokelumne River as well as local drainages are stored in the reservoir for distribution to customers in the service area. Below San Pablo Dam, San Pablo Creek runs through the cities of El Sobrante and San Pablo before entering San Pablo Bay at Wildcat Marsh (SFRWQCB 2001). Wildcat Creek, discussed below, enters San Pablo Creek below the reservoirs.

Portions of the Tilden Regional Park and the Sibley Volcanic Regional Preserve area drain to the upper reaches of the creek, above the San Pablo Reservoir. The proposed project area in Sobrante Ridge Regional Preserve and a portion of the proposed project areas in Wildcat Canyon Regional Park above Alvarado Park drain through Wildcat Creek into lower San Pablo Creek (Figure 4.5-1b and -1c).

Wildcat Creek

Wildcat Creek drains 6,340 acres. Wildcat Creek drains Wildcat Canyon and the western slopes of Vollmer Peak east of Berkeley. It flows north and then west through San Pablo, Richmond, and North Richmond and runs through Wildcat Marsh before entering San Pablo Bay (Figure 4.5-1b and 4.5-1c). Wildcat Creek has a major tributary, Havey Creek, and two small impoundments, Lake Anza and Jewel Lake (Figure 4.5-1c). The first 4 miles of its headwaters are within the EBRPD. The remaining 7 miles of the creek are mostly open (not enclosed in a pipe as part of the stormwater drainage system) even through urban areas (SFRWQCB 2001).

Most of the proposed and connected project areas in Wildcat Canyon and Tilden Regional Parks are in the Wildcat Creek drainage of the San Pablo Bay Estuaries watershed though water from Wildcat Creek does not drain to the San Pablo reservoir or other water supplies in the area (Figure 4.5-1b and 4.5-1c) (Table 4.5-2).

Cerrito Creek – Frontal San Francisco Bay Estuaries Watershed

This watershed drains the western facing slopes of the East Bay hills between Wildcat Creek in the north (Figure 4.5-1b) to Temescal Creek in the south (Figure 4.5-1d). Strawberry and Claremont creeks are in the southern portion of the watershed and contain a number of proposed and connected actions (Figure 4.5-1c). A portion of proposed project area TI012 and connected project area TI012 in Tilden Regional Park is in the Cerrito Creek watershed (Figure 4.5-1c) (Table 4.5-2). These creeks are primarily urban, draining residential areas to the San Francisco Bay.

Codornices Creek

Codornices Creek drains approximately 1,850 acres from the Berkeley Hills to San Francisco Bay through the cities of Berkeley and Albany. Codornices Creek includes Codornices, Marin, Blackberry, and Village Creeks. The majority of Codornices Creek remains in an open natural channel while other creeks in the drainage are highly modified from their natural drainage patterns due to an extensive storm drain network (Sowers and Richard 2009).

Strawberry Creek

Strawberry Creek watershed is approximately 1,163 acres and drains the western slope of the East Bay Hills through the UCB campus to San Francisco Bay (UCB 2007). The north and south forks of Strawberry Creek meet in the western portion of the campus. In the urban areas upstream and downstream of the UCB campus, Strawberry Creek runs through culverts and is "daylighted" or exposed at its headwaters, on the UCB campus, and in a few areas west (downstream) of the UCB grounds (Hans and Maranzana 2007).

Three gaging stations that measure water height, temperature, electrical conductivity, and/or turbidity were installed in Strawberry Creek at the UCB campus in November 2006. The north fork station is at University House, the south fork station is at Stevens Hall, and the mainstem station is above Oxford Street. Baseflow in Strawberry Creek is low during most of the year. Dry weather flow ranges between 0.1 and 0.5 cubic feet per second (cfs) on the main branch of Strawberry Creek, with more than two-thirds of the flow originating from the south fork. Dry weather flows in the creek have decreased since 1987 when UCB began to reduce excessive landscape irrigation to prevent surface water contamination though it is possible that irrigation is replenishing groundwater on the campus, which in turn provides a significant contribution to dry weather flows through aquifer augmentation (Hans and Maranzana 2007). Peak flow for the main branch has been estimated to be in excess of 92 cfs. Peak flows can cause scouring of the streambed, deepening it during high flow periods (Hans and Maranzana 2007, Charbonneau 1987).

The Strawberry Canyon-PDM proposed project area, a portion of the Frowning Ridge-PDM proposed project area, and portions of the proposed and connected project areas in Tilden Regional Park are in upper Strawberry Creek (Table 4.5-2).

Temescal Creek

Temescal Creek drains approximately 4,300 acres, south of Highway 24 and east of Highway 13 (Figure 4.5-1d). Upper Temescal Creek and the Tunnel branch of Temescal Creek flow into Lake Temescal. Water from the lake joins with water from Vicente and Claremont/Harwood creeks, which drain Grandview and Claremont canyons. In the Rockridge District of Oakland, creek water converges into an underground culvert that carries the water through Oakland's Temescal District, through Emeryville, and to San Francisco Bay at the Emeryville Crescent salt marsh (Bergstrom et al. 2008).

Portions of the proposed and connected project areas in Claremont Canyon Regional Preserve, the Caldecott Tunnel-PDM and North Hills–Skyline-PDM proposed project areas are in Temescal Creek (Figure 4.5-1d). A small portion of two proposed project areas (HP001 and HP002) in Huckleberry Botanic Regional Preserve also drains to Temescal Creek (Table 4.5-2).

San Leandro Creek Watershed

The San Leandro creek watershed is a 31,600 acre drainage basin in Alameda and Contra Costa counties (Figures 4.5-1d to 4.5-1f). Redwood Indian, Moraga, Buckhorn, and Kaiser Creeks drain into the Upper San Leandro Reservoir. Grass Valley Creek drains into Lake Chabot. Drainage areas of upper San Leandro Creek above Chabot Dam include the protected watershed of the EBMUD and undeveloped parkland for recreational use held by the EBRPD. San Leandro

Reservoir holds water from the Mokelumne River and local drainage and is used for municipal water supplies.

Moraga and Rheem Valley are also in the drainage area above Upper San Leandro Reservoir. Lower San Leandro Creek, from below Chabot Dam to Arrowhead Marsh, runs for about 6 miles through residential and urban industrial areas of Oakland and San Leandro. San Leandro Creek drains to Arrowhead Marsh in San Leandro Bay just north of the Oakland airport. Although it is channelized and concrete lined in portions of the lower reach, San Leandro creek is one of the few East Bay creeks still entirely above ground (SFRWQCB 2001).

Portions of the proposed and connected project areas in Sibley Volcanic Regional Preserve and Huckleberry Botanic Regional Preserve and in Redwood, Anthony Chabot, and Lake Chabot Regional Parks drain to the San Leandro Creek watershed (Table 4.5-2).

Sausal Creek – Frontal San Francisco Bay Watershed

The Sausal Creek – Frontal San Francisco Bay Watershed drains the southern portion of the western facing slopes from Temescal Creek in the north to San Leandro Creek in the south in Oakland (Figures 4.5-1d to 4.5-1f). Part of some of the proposed or connected project areas are in the upper reaches of the watershed and drain to Shephard, Palo Seco, Arroyo Viejo, Country Club, and/or Rifle Range creeks. These include proposed projects RD004, RD005b, and LE005, and connected action AC007 (Figure 4.5-1d to 4.5-1f). These frontal watersheds drain primarily urban areas to the San Francisco Bay.

Sausal Creek

The headwaters of Sausal Creek are in the Oakland Hills, and the upper watershed includes Sausal, Shephard, and Palo Seco Creeks. Sausal Creek meets with the Whittle Avenue branch in an urban portion of the city, flows through channels and storm drains, and discharges into the tidal canal that separates Alameda from Oakland (Friends of Sausal Creek 2011).

A portion of the proposed and connected project areas in Redwood Regional Park drains to the Sausal Creek Watershed (Table 4.5-2).

Arroyo Viejo Creek

Arroyo Viejo Creek drains the Oakland Hills between Merritt College and Knowland Park. The Rifle Range, Melrose Highlands, and Country Club branches meet upper Arroyo Viejo Creek at I-580 near Golf Links Road. Downstream of this location, Arroyo Viejo Creek runs across east Oakland, mostly through open, private land. The creek enters the San Francisco Bay at Damon Marsh, part of Martin Luther King, Jr. Regional Shoreline, which encircles San Leandro Bay (Pollock 1993).

The proposed project area in the Leona Canyon Regional Open Space Preserve drains to the Arroyo Viejo Creek watershed (Figure 4.5-1e to 4.5-1f) (Table 4.5-2).

4.5.2.2.2 Review of Historical and Current Subapplicant Programs and Activities Related to Herbicide Use

This section describes the subapplicants' policies and programs related to use of herbicides. Pesticide regulations, which include regulations for herbicides being used by each of the subapplicants, are also described below.

UCB

UCB Vegetation Programs

UCB has had a UCB Fire Mitigation Committee (UCFMC) since the mid-1980s whose mission is to identify, mitigate, control, reduce and report on fire risk in and surrounding the UCB campus. Between the mid-1980s and 1995, fire mitigation work was prescribed by an earlier fire ecology consultant and was then passed through the University of California Environment, Health and Safety (EH&S) group to Physical Plant – Campus Services. The fire prevention work was conducted primarily by gardeners and groundskeepers. The 1991 Tunnel Fire and the formation of the HEF led to additional focus on fire risk and prevention in the hills of the UCB campus. In June 1995, Safe Solutions Group developed annual fire prevention actions. In 2001, the UCFMC took on a pilot project to thin eucalyptus trees that had been killed in a freeze. Eucalyptus reduction activities were continued based on the success of that project. However, because the Hill Area is home to the headwaters of several watersheds and streams and at least one sensitive species, the UCFMC needed to balance the fire prevention needs with environmental protection goals. The 2020 Hill Area Fire Fuel Management Program (2020 HAFFMP) was borne from this need (UCB 2003).

The UCFMC manages an ongoing program that addresses fires that initiate in the hilly eastern portions of the campus, where wildfires threaten Priority 1 (private) and Priority 2 (public) structures and surrounding vegetation. These areas continue to be treated under state and local fire codes. Priority 3 areas (ornamental and wildlands capable of generating or feeding spot fires) are added under the 2020 HAFFMP (UCB 2003), which updated and formalized the Campus Hill fire risk management plan and procedures, describes local fuel types, prescribes mitigation actions, and identifies constraints to mitigation. The purpose of the 2020 HAFFMP is to prescribe and implement fire fuel hazard mitigation in areas where people are concentrated, to address vegetation management in adjacent areas, and to maintain evacuation routes. Two types of actions are proposed: Priority 1 and 2, which focuses on the intermix of vegetation and structures and Priority 3, which focuses on the management of vegetation to reduce the fuel load in the wildlands. The prescriptions are intended to be both preventive and facilitative efforts that would include maintaining staging areas and firebreaks and coordinating fire-fighting personnel and equipment access. Priority 3 management zones include those where treatment is feasible and those where it is not.

The 2020 HAFFMP includes fuel management and treatment techniques and associated mitigation measures, which are provided in Appendices B and D of the 2020 HAFFMP (adapted from the EBRPD Vegetation Management Projects Alameda and Contra Costa Counties, California HMGP #919-515-24, April 2003). The prescribed treatment methods are provided therein for stands of eucalyptus, mixed hardwoods, and Monterey pine, as well as for native and non-native understory and brush. The program indicates that each specific area would be

evaluated for the potential issues related to application of pesticides and the other environmental concerns prior to its use and would include the implementation of necessary mitigation measures to minimize or prevent impacts, which are provided in Appendix B of the HAFFMP.

UCB Herbicide Use Records

UCB provided herbicide-use records for the past 10 years (Klatt 2011b). The use records were for the Physical and Environmental Planning Department and excluded uses by other UCB entities such as the Grounds, Intercollegiate Athletics, Botanical Garden, and Recreational Sports departments. The herbicide records documented applications in fuel reduction areas in the near vicinity of the proposed and connected project areas, with some possible overlap into the Frowning Ridge area. The herbicides used included glyphosate applied as a cut stump spray, imazapyr applied as a basal bark spray, triclopyr applied using foliar low pressure, and clopyralid applied using foliar high pressure. Clopyralid has not been used since 2006.

Oakland

City of Oakland Pesticide Use Policy and Ban

Under a resolution passed on December 16, 1997, Oakland currently bans the use of pesticides with 11 stated exemptions (City of Oakland 1997). For certain exemptions, including Forestry Management applications, restrictions were imposed, including conformance with Alameda County Health Agency guidelines, and use of the least hazardous effective available pesticide that is also approved and registered with the EPA and California Department of Pesticide Regulation. Any application of pesticides requires the use of applicators that are licensed by the State of California as pest control operators and public notification prior to any treatment. Treatment must also include marker dyes and public education programs. Involvement of the Citizens' Integrated Pest Management (IPM) Advisory Committee is mandated to provide advice to the city council on pest control practices.

The March 2010 city council's report on preparation of an IPM plan for Oakland and allowing certain pesticide uses provided a description of the application of herbicides in fuel reduction projects.

A report was prepared on March 22, 2005 regarding the preparation of environmental documents under California Environmental Quality Act (CEQA) for the purpose of a limited exemption to the ban on pesticide uses specifically for fuel reduction projects. The following requirements were included in the 2005 resolution.

> "**Herbicide Application**. Aerial or ground spraying is not permitted under this policy. When herbicides are needed for vegetation control, best management practices call for direct application to the plant or tree either by hand painting the herbicide directly on to the cambium of the freshly cut tree or plant stump or bottle spritzing, no further than 6 inches away, onto freshly cut pampas grass clumps. In order to apply the herbicide to the stump or grass clump, all of the plant or tree's foliage (leaves, branches, trunks) must be hand or mechanically cut away until nothing is left but a stump or clump. When glyphosate and triclopyr are applied in this manner, the herbicide is absorbed within the plant or tree's system and does not migrate into the surrounding soil.

> **Herbicide Formulations**. The exemption would be limited to the use of two herbicides: glyphosate (in formulations such as Roundup or Rodeo) and triclopyr (in formulations such as Garlon and Pathfinder). These are federally- and California-registered pesticides for the control of woody plant species and broad leaf plants in right of ways, forests, open space parks, ditch banks, and maintenance of wildlife corridors. The EPA categorically ranks herbicide toxicity on a scale between 1 and 4 as follows:
>
> Category 1 - Highly Toxic; Category 2 - Moderately Toxic; Category 3 -Slightly Toxic; Category 4 - Not Acutely Toxic. Both glyphosate and triclopyr have received the lowest ranking for toxicity or a Category 4. In accordance with the city's IPM policy and Best Management Practices, the choice of formulation for each type of application would be determined based on environmental factors as well as the product's capabilities. Glyphosate and triclopyr would only be used when conditions and best management practices demonstrate that a chemical treatment would be the most effective approach and would only be applied to the list of plants previously identified in this report and those new non-native plants that may be identified in the Wildfire Prevention Assessment District's yearly report.
>
> **Use of Herbicides by Surrounding Jurisdictions**. Oakland is one of two jurisdictions in Alameda County that either ban or partially ban the use of herbicides for weed control. UCB uses herbicides for vegetation management. Other public agencies utilizing herbicides include EBRPD and East Bay Municipal Utility District. Both agencies have fire prevention and vegetation management responsibilities within Oakland city limits." (City of Oakland 2005).

However, the document titled *Wildfire Prevention Program 2008-2010, Bi-Annual Vegetation Management Plan*, prepared by the City of Oakland Fire Department, provides a description of ongoing activities related to chemical treatment for an herbicide demonstration project along Shepherd Canyon Road on five city parcels next to the Municipal Corporation Yard and Oakland Fire Department Station 24. The following excerpt (p. 23) includes the use of Stalker (imazapyr):

> The herbicide prescription would be written by a Certified Pesticide Applicator and the application would follow the label directions. The herbicide solution would be applied to the cambium layer of the freshly cut tree stump within a few minutes of felling. The herbicide mixture would likely consist of a combination of Garlon4 (tricloypyr) and Stalker (imazapyr) in a solution of esterified seed oil, water, and marking dye. A typical tree requires between 1 and 2 ounces of diluted solution. [0.5 ounces solution per lineal foot of cambium]. All cut tree stumps shall receive semi-annual follow-up treatment of herbicides (Garlon4, Stalker, Roundup) on any emerging stump sprouts to ensure the permanent elimination of eucalyptus from the project area. Follow up treatment of sprouts would be conducted until 100% removal is obtained.

The Oakland pesticide ban exempts, that is, allows "the use of pesticidal soaps, insect growth regulators, microbials, botanicals, synthetic pyrethroids, horticultural oils, and insecticidal bait stations."

In addition, the city provided a response to questions as a result of the preparation of this EIS, describing their use of pesticides to treat cut stumps and follow-up treatments, which include the use of Garlon4 and Stalker, as follows:

> All cut eucalyptus stumps shall receive annual follow-up treatment of herbicides (Garlon4, Stalker) on any emerging stump sprouts, to ensure the permanent elimination of eucalyptus from the project area. Follow up treatment of resprouts and seedlings emerging from the latent seed stock present in the project area would be managed over time to prevent re-colonization of this invasive species.

EBRPD

EBRPD Vegetation and Pest Management Programs

Beginning in the 1970s, EBRPD attempted to limit use of toxic chemicals on its park lands. The 1987 EBRPD Pest Management Policies and Practices included a policy stating: "In accordance with the accepted principles of ecology, the District will strive to implement an integrated pest management program which eliminates the use of chemicals as much as feasible whenever alternative methods are effective" (EBRPD 1987). EBRPD identified a number of wildland management issues in the 1997 Master Plan (EBRPD 1996), as follows: management of wildland areas may require the use of IPM[1] practices for the control of plant and animal pests. Agricultural sites and cultivated areas within EBRPD jurisdiction may also be managed in accordance with IPM methods to control noxious weed infestations, brooms, and other invasive non-native plants. The use of IPM methods by EBRPD is to minimize the impact of undesirable species on natural resources and to reduce pest-related health and safety risks to the public in developed facilities and/or high-use recreational areas. The first Proposed Pest Species Management Program was initiated by EBRPD in 1982 (EBRPD 1982). By 1987, a more comprehensive IPM plan was prepared, which underwent CEQA review.[2] The 1987 IPM plan was implemented beginning in 1988 (EBRPD 1987); a summary of the plan follows. As required by state and local requirements, EBRPD analyzes the annual amount of pesticide usage through the areas under its jurisdiction. The latest pesticide use reports available for review as the writing of the EBRPD Vegetation Plan EIR was for the years 2007 and 2008. More recently, EBRPD has published the

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[1] The EBRPD definition of IPM is "a strategic approach for preventing and suppressing pest problems before they reach unacceptable levels. Using IPM means selecting and integrating the most appropriate combinations of available pest control methods (including cultural, mechanical, chemical, and biological) for a given site/pest occurrence in ways that minimize risk to public safety, health and the environment. It is important to understand that while the goal of IPM programs is the same—long-term resolution to pest problems—the actual specific set of strategies selected will vary by park location, the season, type of pest, habitat considerations, level of desired control and cost factors. Additionally, current practices would change as new information and new technologies are developed." EBRPD 2009a

[2] A Negative Declaration was prepared on the 1987 IPM Plan (not available for review).

The Pest Management Advisory Committee (PMAC) is a five-member professional advisory committee appointed by the Board that oversees the IPM program effectiveness, develops long-term pest management programs, among other tasks.

The Ecology Committee is a joint union-management committee with two union representatives and two representatives appointed by District management staff and at least two Board of Directors members. The function is advisory through recommendations to the District Board, PMAC, or staff.

2008 Annual Analysis of Pesticide Use East Bay Regional Park District (EBRPD 2009a). The use of IPM methods by EBRPD is to minimize the impact of undesirable species on natural resources and to reduce pest-related health and safety risks to the public in developed facilities and/or high-use recreational areas.

1987 Integrated Pest Management Plan

The 1987 Pest Management Policies and Practices for EBRPD, Resolution Number 1987-11-325 (1987 IPM Plan) was prepared to consolidate all relevant EBRPD board-adopted policies, administrative directives, and "state of the art" pest management practices pertaining to agricultural and structural uses on EBRPD lands. The plan is supported by the EBRPD Board of Directors and staff, an IPM specialist, and two advisory committees: the Pest Management Advisory Committee (PMAC)[3] and the Ecology Committee.[4]

The major implementation components of the plan include (1) a monitoring program for pests; (2) use of pesticides only with prior authorization (by the IPM specialist or PMAC); (3) completion of an IPM checklist and pesticide use report; (4) notification and posting; (5) general chemical safety and environmental concerns, where records of pesticide use are periodically reviewed by the PMAC to ensure compliance with applicable rules and regulations; and (6) an IPM training program for workers. The plan was prepared to set a framework for the use of IPM methods within EBRPD lands and to comply with local, state, and federal requirements for pesticide management.

2008 Annual Analysis of Pesticide Use

The 2008 Pesticide Use Report for EBRPD (EBRPD 2009a) includes pest management needs and practices within the properties owned and managed by EBRPD. EBRPD's 2008 Annual Analysis of Pesticide Use (EBRPD 2009a) states that EBRPD's approved list of herbicides included:

- Roundup (glyphosate)
- Surflan (oryzalin)
- Banvel (dicamba)
- Garlon (triclopyr)
- Casoron (dichlobenil)

Each of these pesticides are considered EPA Category III and IV pesticides, "use with caution" (EPA 2007). No category I (danger) or category II (warning) herbicides were on the Board-approved list of herbicides for EBRPD in 2007.

[4] The Ecology Committee is a joint union-management committee with two union representatives and two representatives appointed by District management staff and at least two Board of Directors members. The function is advisory through recommendations to the District Board, PMAC or staff.

The amount of each pesticide used by EBRPD is tracked and accounted for on an annual basis. In addition, the office of the IPM specialist advises EBRPD park supervisors and concessionaires (including golf courses) on how to work toward the goal of reducing the need and number of annual pesticide applications. Prior authorization by the IPM specialist is required before purchase and/or use of a pesticide is permitted for accountability and to ensure compliance with requirements for worker training.

The overall usage in 2008 of Board-approved herbicides (Roundup, Surflan, Banvel, Garlon, and Casoron) was similar to that recorded in 2007, with a slight increase of Roundup use (29%) for park operations and a decrease (25%) of use in resource management projects.

This report lists various EBRPD areas and how much of each of the above-mentioned herbicides were used in each area. The 2008 Annual Analysis of Pesticide Use also contains an approved list of pesticides for EBRPD for 2008 in that report's Appendix A. The approved list in this appendix includes more than the aforementioned list of approved pesticides. The following additional approved herbicides are included:

- Oxadiazon (Ronstar)
- Rodeo (glyphosate)
- Pathfinder (triclopyr)

In 2008, Transline (chlopyralid) was an experimental herbicide under review. Habitat (imazapyr) was also under review in 2008. The report does not say how much of these herbicides were used.

EBRPD Hazardous Materials Business Plans

EBRPD has a Hazardous Materials Business Plan (HMBP) for its Tilden Corporation Yard, which houses Fire Station #1. The proposed and connected actions would be conducted from Fire Station #1 and from a central warehouse that supplies pesticides to EBRPD as a whole. EBRPD prepared its most recent HMBP in 2010. In that plan, EBRPD did not use a sufficient quantity of pesticides to warrant inclusion in the plan. However, the 2010 HMBP was not made available and, therefore, was not reviewed. EBRPD stated that although they have used Roundup Pro in the past, only Garlon4 would be used in the treatment areas (Rasmussen 2011).

EBRPD's Prescriptions for the Control of Invasive Plant Species and Noxious Weeds (EBRPD 2009c)

The document prescribes control methods for various types of plants, including specific herbicides to be used for each plant type. The document states that whatever is used by EBRPD or their contractors should be in accordance with EBRPD's Pest Management Policies and Practices Resolution.

EBRPD's East Bay Hills Wildfire Hazard Reduction, Resource Management Plan and Environmental Impact Report (EBRPD 2010)

This document was prepared to evaluate impacts associated with implementing EBRPD's Draft Wildfire Hazard Reduction and Resource Management Plan for the vegetation management strategy to reduce the possibility of large, high severity wildfires on park lands within the Oakland Hills wildland-urban interface (WUI). The plan is not intended to prevent all fires but is

intended to modify the behavior of those fires that occur on park lands in the Oakland Hills WUI, so that they are less intense and produce fewer lofted embers, allowing them to be suppressed at a smaller size and cause less damage. Part of this strategy included the option of herbicide application. The evaluation of this option concluded that herbicide application could lead to potential water quality impacts since the herbicides could runoff into surface water bodies in the treatment area. To mitigate potential impacts, best management practices were presented.

4.5.2.2.3 Review of Historical and Current Subapplicant Programs and Activities Related to Erosion and Subsequent Sedimentation and Turbidity of Surface Water

This section describes the subapplicants' policies and programs related to erosion that can impact water quality by increasing sedimentation and turbidity.

UCB

UCB Vegetation Programs

The 2020 HAFFMP, which is described in detail above, includes UCB's fuel management and treatment techniques and associated best management activities or mitigation measures to reduce the effects of erosion that could impact water quality.

Oakland

Oakland Creek Protection Ordinance OMC 13.16 (Oakland Public Works Agency 1997 and Watershed Improvement Program)

Oakland's City Council passed the Ordinance in 1997, in part, to reduce pollution and improve water quality and to reduce erosion and sedimentation of the city's creeks. The ordinance makes it illegal to dump sediment into the stormwater system or directly into a creek and requires the use of best management practices to reduce pollution from construction or business practices.

EBRPD

EBRPD's East Bay Hills Wildfire Hazard Reduction, Resource Management Plan and Environmental Impact Report (EBRPD 2010)

This document was prepared to evaluate impacts associated with implementing EBRPD's Draft Wildfire Hazard Reduction and Resource Management Plan for the vegetation management strategy to reduce the possibility of large, high severity wildfires on park lands. The hydrology and water quality section of the document provides the hydrological setting and baseline water quality conditions for the study area subject to the EIR and reviews the potential impacts to water resources resulting from implementing the plan. The potential impacts include effects from runoff and sedimentation of water resources included in the study area.

EBRPD's Master Plan 2012 Public Draft September 2012 (EBRPD 2012d)

This plan indicates that loss of soil due to erosion from wind, rain, and landslides is a key management area for park lands since sedimentation can degrade water quality. Erosion can occur due to natural features of the land, such as steep slopes, flooding from excess rainfall, or wildfires. However, it can also be due to past or ongoing anthropogenic activities. The plan states that "the most successful long-term approach to controlling soil erosion is to maintain vegetative cover and vegetation residue, as this approach forms a barrier to erosion and impedes the

overland flow of water by increasing infiltration and inhibiting runoff." It further states that "the District will identify existing and potential erosion problems and take corrective measures to repair damage and mitigate its causes. The District will manage the parks to assure that an adequate cover of vegetation remains on the ground to provide soil protection. Where vegetative cover has been reduced or eliminated, the District will take steps to restore it, using native or naturalized plants adapted to the site. The District will minimize soil disturbance associated with construction and maintenance operations and would avoid disruptive activities in areas with unstable soils, whenever possible. The District will arrest the progress of active gully erosion where practical, and take action to restore these areas to stable conditions."

4.5.2.2.4 Surface Water Quality

Several of the water bodies listed in the Basin Plan for which beneficial uses have been designated, occur in the proposed and connected project areas (Figures 4.5-1c and 4.5-1d; Basin Plan Appendix C). These water bodies are shown in Table 4.5-3 along with their designated beneficial uses. In 2004, EPA and RWQCB designated a number of creeks that drain to San Francisco Bay as impaired for Diazinon, a once common household pesticide. However, Diazinon was phased out of household use at the end of 2004 and would not be used as part of the proposed or connected action. A 2005 RWQCB outlined management actions to reduce concentrations and provide management practices to ensure compliance with the target concentrations of the pesticide, but because the pesticide would not be used as part of the proposed project, these management practices are not applicable. No other impairments were noted in the report. None of the water bodies in the proposed and connected project areas is on the 303(d) list for impaired water bodies (SFRWQCB 2006); therefore, none of the water bodies has TMDL regulations. However, all of these creeks drain into the central portion of San Francisco Bay, which is listed as impaired for multiple pollutants, including chlordane, DDT, dieldrin, dioxin, non-native species, furan compounds, mercury, polycyclic aromatic compounds, polychlorinated biphenyls, and selenium on the Section 303(d) list.

Table 4.5-3. Streams with Existing Designated Beneficial Uses

Water Body	Beneficial Uses
Claremont Creek	WARM, WILD, REC-1, REC-2
Cordornices Creek	COLD, MIGR, RARE, SPWN, WARM, WILD, REC-1, REC-2
Cerrito Creek	WARM, WILD, REC-1, REC-2
San Leandro Creek	FRSH, COLD, MIGR(P), SPWN(P), WARM, WILD, REC-1, REC-2
Strawberry Creek	WARM, WILD, REC-1, REC-2
Temescal Creek	COLD, WARM, WILD, REC-1, REC-2

Source: SFRWQCB 2011.

COLD=cold freshwater habitat
FRSH=freshwater replenishment
MIGR=fish migration
(P)=potential use; water bodies where existing water quality to support the designated beneficial use can reasonably be achieved
RARE=preservation of rare and endangered species
REC-1=water contact recreation
REC-2=noncontact water recreation
SPWN=fish spawning
WARM=warm freshwater habitat
WILD=wildlife habitat

Surface water in the proposed and connected project areas is composed predominately of urban and natural creeks that drain to San Francisco Bay. Due to the urban setting, several of these water bodies are subjected to anthropogenic inputs; however, local ordinances and management strategies have been put in place to minimize such impacts. Overall, the data suggest that water quality of the creeks within the proposed and connected project area is not impaired due to chemical contamination and that the water may be used for a variety of beneficial uses, as described below, including fish habitat for resident and migratory species.

4.5.3 Groundwater

This section contains a discussion of the existing groundwater (e.g., aquifers, groundwater basins) in the proposed and connected project areas, based on existing literature, and includes known groundwater quality issues. Groundwater provides excellent natural storage, distribution, and treatment systems. Groundwater also supplies high quality water for drinking, irrigation, and industrial processing and service. Groundwater may also discharge to surface streams, wetlands, and San Francisco Bay (SFRWQCB 2011).

The proposed and connected project areas are in and directly east of the East Bay Plain Subbasin of the Santa Clara Valley Groundwater Basin (SFRWQCB 2011, Figure 4.5-2). A portion of the larger groundwater basin, the East Bay Plain Subbasin, is a northwest-trending alluvial plain bounded on the north by San Pablo Bay, on the east by the contact with Franciscan Basement rock, and on the south by the Niles Cone Groundwater Basin. The East Bay Plain Subbasin extends beneath San Francisco Bay to the west (California Department of Water Resources [DWR] 2004). There is no defined groundwater basin to the immediate area east of the East Bay Plain Subbasin (SFRWQCB 2011; Figure 2-10).

4.5.3.1 Hydrogeology

The East Bay Plain contains an upper aquifer system to a depth of 250 feet below land surface and an underlying lower aquifer system to depths of more than 650 feet (U.S. Geological Survey [USGS] 2003). This subbasin aquifer system consists of unconsolidated sediments of Quaternary age. Deposits include the early Pleistocene Santa Clara Formation, the late Pleistocene Alameda Formation, the early Holocene Temescal Formation, and Artificial Fill. The cumulative thickness of the unconsolidated sediments is about 1,000 feet. The average specific yield of the basin was calculated to be about 6% of the volumetric fraction of the bulk aquifer volume (DWR 2004).

The early Pleistocene Santa Clara Formation consists of alluvial fan deposits inter-fingered with lake, swamp, river channel, and flood plain deposits. The formation ranges between 300 and 600 feet thick (DWR 2004). The late Pleistocene Alameda Formation includes a sequence of alluvial fan deposits bounded by mud deposits on top and bottom of the formation. The formation was deposited primarily in an estuarine environment and ranges between 26 and 245 feet thick (DWR 2004). The early Holocene Temescal Formation is an alluvial deposit consisting primarily of silts and clays with some gravel layers. The formation ranges between 1 and 50 feet thick (DWR 2004).

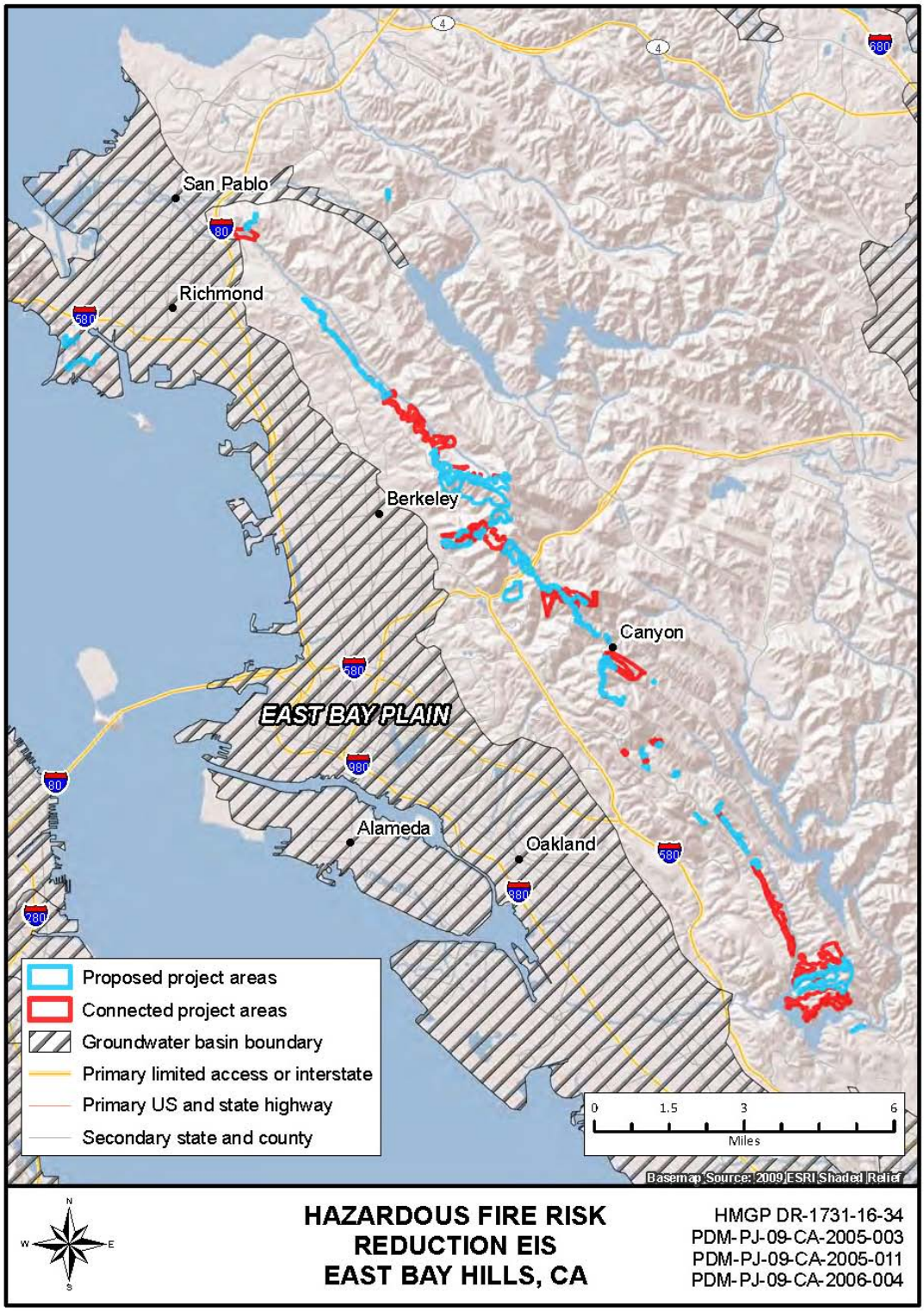

Figure 4.5-2. East Bay Plain Subbasin of the Santa Clara Valley Groundwater Basin

Artificial Fill is present mostly along the bay front and wetlands areas. Within the proposed and connected project area boundaries, it is likely only found in the Miller/Knox Regional Shoreline area.

Throughout most of the Alameda County portion of the East Bay Plain Subbasin, water level contours show that the direction of groundwater flow is east to west or from the Hayward fault to San Francisco Bay. In the southern end of the East Bay Plain, in the San Lorenzo area, the direction of flow may be flowing south in the upper aquifers and north in the deeper aquifers (SFRWQCB 1999).

Groundwater recharge sources include rainfall infiltration, stream seepage, pipe leakage, agricultural return water, and subsurface inflow.

4.5.3.2 Groundwater Beneficial Uses

Between the 1860s and the 1930s, all water supplies to the East Bay Plain Subbasin area were provided by groundwater, springs, and local reservoirs. As a result of development of various Sierra Nevada water supplies in the 1920s and 1930s, all local East Bay Plain Subbasin municipal water supplies were abandoned. Since then, the East Bay Plain Subbasin has not been a regional source of water. The East Bay Plain Subbasin is used locally for irrigation, industrial and emergency water supply, and as a limited drinking water supply (SFRWQCB 1999).

The SFRWQCB has designated beneficial uses for each groundwater basin within its jurisdictional region. The beneficial uses for the East Bay Plain Subbasin are municipal and domestic water supply, industrial process water supply, industrial service water supply and agricultural water supply (SFRWQCB 2011, Table 2-2).

The most frequent current use of groundwater in the East Bay Plain Subbasin is for irrigation from “backyard” private shallow wells. It is estimated that groundwater from this subbasin is used by over 4,000 homeowners for irrigation (SFRWQCB 1999).

Groundwater is also still used by 10 businesses for industrial purposes and by several users to irrigate a few parks, golf courses, cemeteries, and schools. Groundwater is used for drinking water by several small systems in the cities of Hayward, San Leandro, and Oakland (SFRWQCB 1999). Most of the wells in the East Bay Plain Subbasin are between 0 and 100 feet, but many wells are within the range between 100 and 834 feet.

4.5.3.3 Groundwater Quality

Calcium-bicarbonate type groundwater occurs mostly in the upper 200 feet of the East Bay Plain Subbasin’s subsurface while sodium-bicarbonate waters are common from between 200- and 1,000-foot depths (DWR 2004). Data from 29 wells in the subbasin indicate that total dissolved solids (TDS) in the shallow zone ranges from between 360 and 1,020 milligrams per liter (mg/L) while TDS between 200 and 1000 feet below ground surface ranges between 310 and 1,420 mg/L from 13 wells (Muir 1997). TDS exceeded 500 mg/L in 15 of the 29 sampled wells (DWR 2004).

Saltwater intrusion has occurred in portions of the deeper aquifers as a result of historic large-scale pumping prior to 1930 (SFRWQCB 1999).

Groundwater in the proposed and connected project areas has been affected by historical and ongoing localized releases of fuels and solvents and can be impacted by historical or current herbicide use if herbicides are applied to land in sufficient quantities to leach to groundwater. Groundwater pollution appears to be generally restricted to portions of the shallow aquifers. Ambient monitoring data on common organic pollutants in the deeper groundwater (i.e., deeper than about 100 feet) are very limited; however, based on this data, the overall water quality of the deeper aquifer in the East Bay Plain Subbasin is good (SFRWQCB 1999).

4.5.4 Floodplains

This section includes a discussion of the floodplain, the National Flood Insurance Program (NFIP), the community's involvement in the NFIP, and designated flood hazards and floodplains in the proposed and connected project areas based on FEMA's Flood Insurance Rate Maps (FIRMS). Increased sediment deposition and turbidity resulting from flooding events have the potential to impact water quality by increasing the sediment load into surface water bodies during flooding events and as water recedes. The FIRMs show the Special Flood Hazard Area (the 100-year floodplain), which consists of areas inundated by the flood having a 1% chance of occurring in any given year.

Table 4.5-4 shows the FIRM panels that include the project areas. Of the 105 proposed and connected project areas, one contains a 100 year floodplain. Connected project area WC005 in Alvarado Park in Richmond contains a segment of the 100-year floodplain along Wildcat Creek (see Figures 4.5-3a, 4.5-3b, and 4.5-3c). The floodplain in WC005 is a maximum of approximately 120 feet wide and appears on FIRM panel 06013C0229F. Adjacent connected project area WC006 is approximately 300 feet from this floodplain. Nine other proposed and connected project areas are 0.13 and 0.35 mile from a 100-year floodplain along Wildcat Creek, Temescal Creek, or San Leandro Creek. The five proposed project areas in Miller/Knox Regional Shoreline are close to the 100-year floodplain in and near San Francisco Bay. All of the other proposed and connected project areas are half a mile or more from the nearest 100-year floodplain.

Table 4.5-4. FIRM Panels for the Project Area

Contra Costa County	Alameda County
06013C0220F	06001C0019G
06013C0229F	06001C0080G
06013C0234F	06001C0095G
06013C0240F	06001C0257G
06013C0245F	06001C0278G
06013C0264F	
06013C0265F	
06013C0408F	

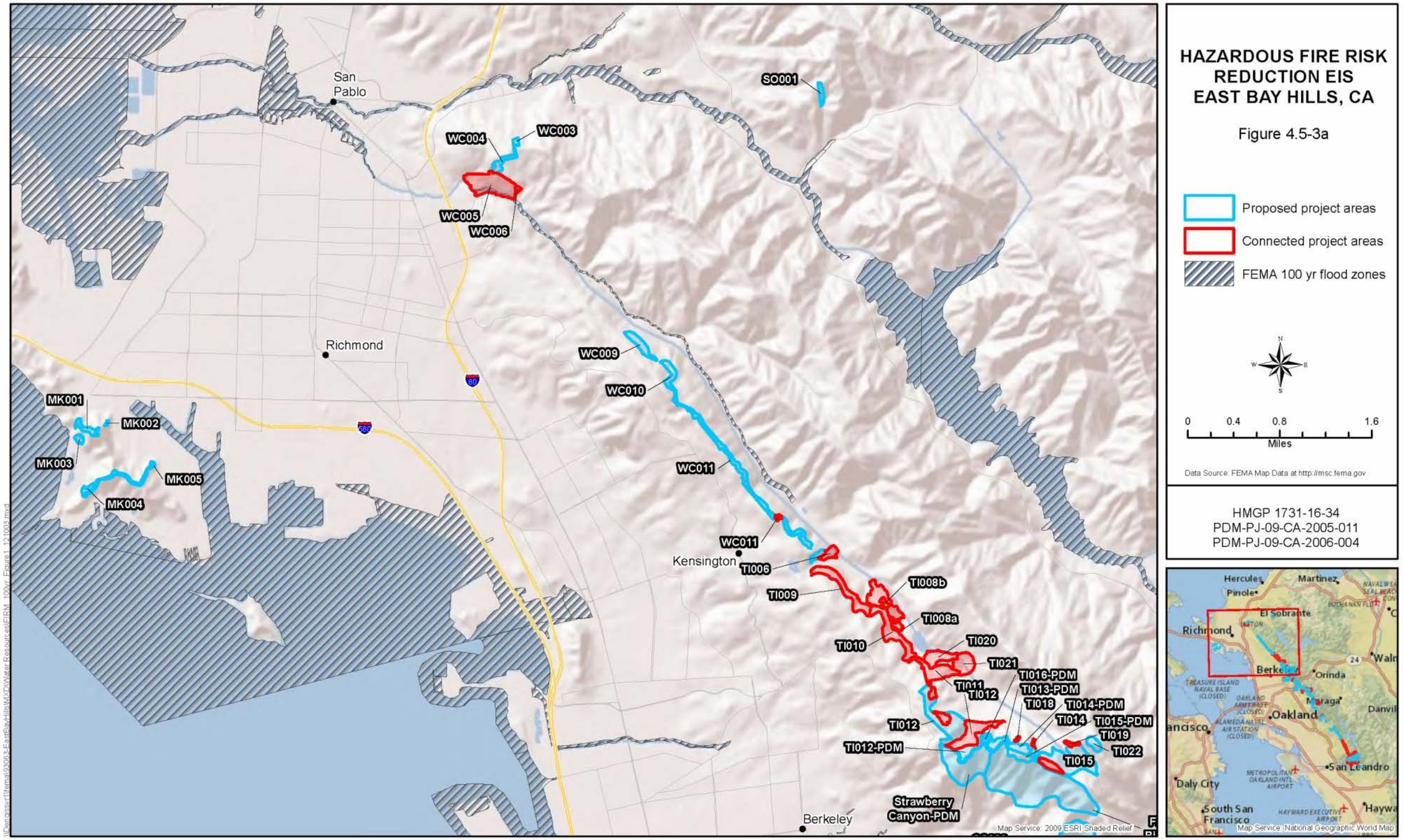

Figure 4.5-3a. FEMA 100-Year Flood Zones

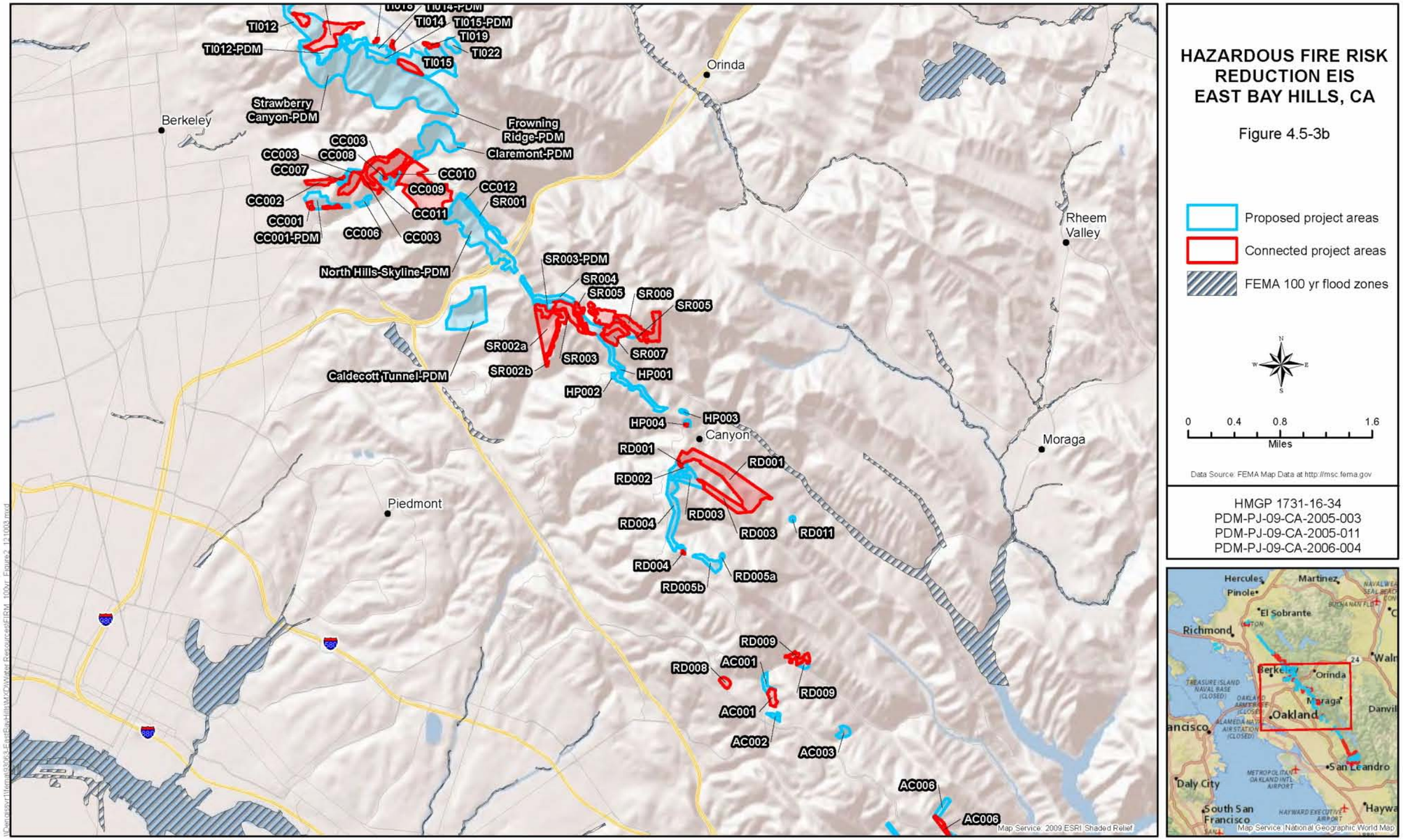

Figure 4.5-3b. FEMA 100-Year Flood Zones

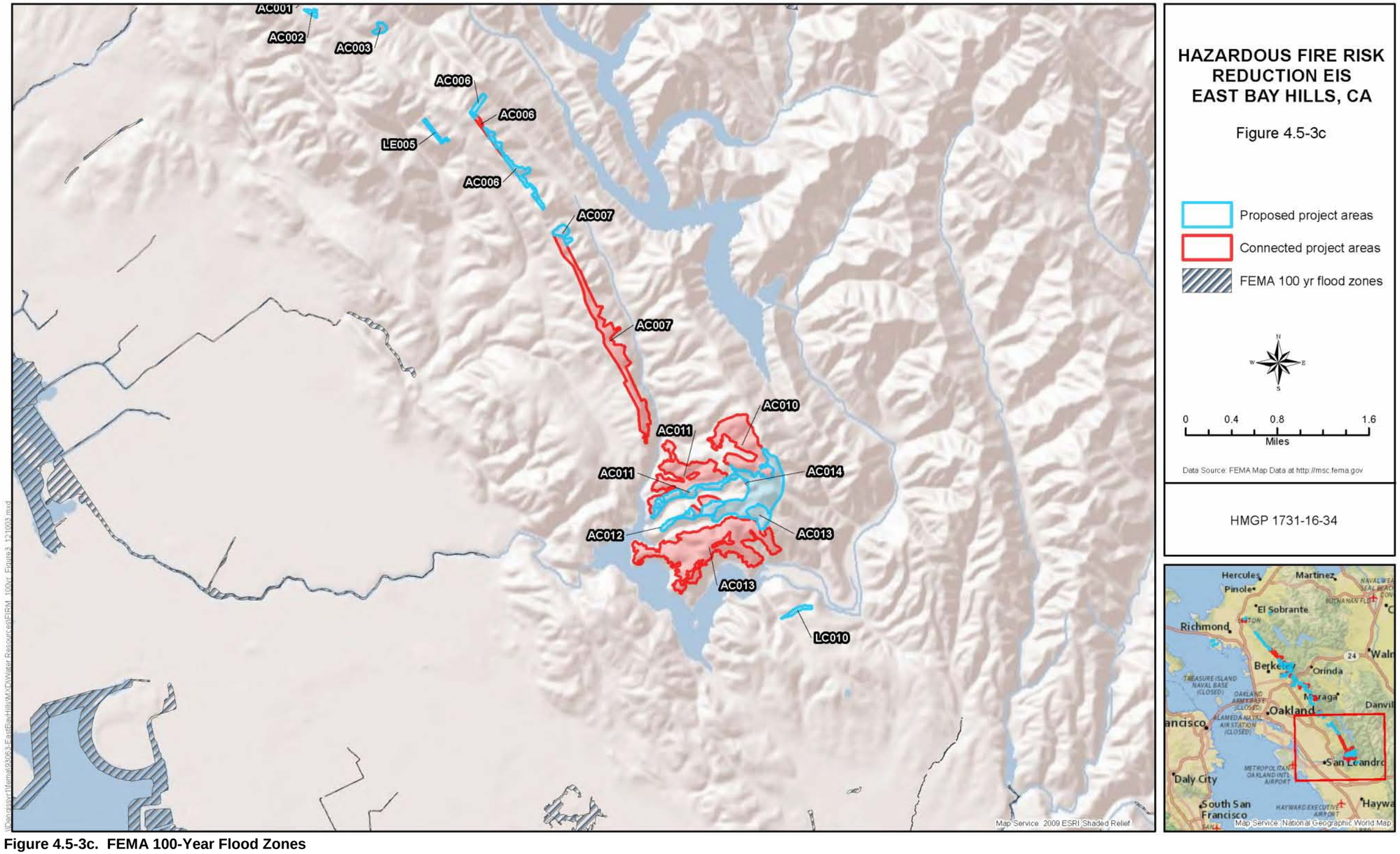

Figure 4.5-3c. FEMA 100-Year Flood Zones

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4.6 Air Quality

This section presents a brief summary of the current regulatory setting and information on existing air quality conditions in the East Bay Hills.

4.6.1 Regulatory Setting

In response to concerns about air pollutants and greenhouse gases, federal legislators have passed statutes that mandate control of ambient pollutants, and federal agencies have adopted rules and regulations to implement these laws. This section briefly discusses the federal laws, orders, and regulations that impact air quality and air pollutant emissions in the San Francisco Bay Area air basin (SFBAAB).

4.6.1.1 Criteria Air Pollutants

The federal statute that addresses criteria pollutants is the Clean Air Act (CAA). The CAA was first enacted in 1955 and has been amended numerous times in subsequent years (1963, 1965, 1967, 1970, 1977, 1990, and 1997). EPA has been granted authority to implement the CAA through development and adoption of rules codified under 40 CFR, Subchapter C – Air Programs. EPA has generally applied a two-pronged approach to controlling air pollution: (1) setting National Ambient Air Quality Standards (NAAQS) that define maximum pollution levels in air that are still protective of human health and welfare and (2) developing emission standards for sources of air pollutants to reduce pollutant emissions to the atmosphere.

4.6.1.1.1 National Ambient Air Quality Standards

Under the authority granted by the CAA, EPA has established NAAQS for the following criteria air pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3)[1], particulate matter 10 micrometers (μm) or less in diameter (PM-10), particulate matter 2.5 μm or less in diameter (PM-2.5)[2], and sulfur dioxide (SO_2). Primary NAAQS were established to protect human health while secondary NAAQS were created to protect public welfare and take into consideration such factors as damage to crops, architecture and ecosystems, and visibility in scenic areas. Table 4.6-1 presents the NAAQS that are currently in effect for criteria air pollutants.

[1] Ozone (smog) is a secondary pollutant, meaning that it is formed in the atmosphere through a reaction of precursor compounds in the presence of sunlight. The important precursors for O_3 formation are oxides of nitrogen (NOx) and volatile organic compounds (VOC). Air quality impact analyses for O_3 typically assess the increase in emissions of NOx and VOC.

[2] PM-2.5 is made up of directly emitted particulate matter as well as secondary particulate matter that is formed through reactions of precursor compounds. The important gaseous precursors for PM-2.5 formation are NOx, VOC, sulfur oxides (SOx), and ammonia (NH_3).

Table 4.6-1. National Ambient Air Quality Standards (NAAQS)

Pollutant	Average Time	Primary NAAQS	Secondary NAAQS	Violation Criteria
Carbon monoxide (CO)	8-hour average	9 ppm	None	If standard is exceeded more than once per year
	1-hour average	35 ppm		If standard is exceeded more than once per year
Lead (Pb)	Calendar quarter	1.5 $\mu g/m^3$	Same as Primary Standard	If the standard is exceeded more than once per year
	Rolling 3-mo average	0.15 $\mu g/m^3$	Same as Primary Standard	If the maximum 3-month average over a 3-year period exceeds the standard
Nitrogen dioxide (NO_2)(1)	Annual average	53 ppb	Same as Primary Standard	If annual average exceeds the standard in a calendar year
	1-hour average	100 ppb	No standard	If the 3-year average of the annual 98th percentile of the daily maximum 1-hour concentration exceeds the standard
Ozone (O_3)	8-hour average	0.075 ppm	Same as Primary Standard	If standard is exceeded on more than 3 days in 3 years
Particulate matter (PM-10)	24-hour average	150 $\mu g/m^3$	Same as Primary Standard	If standard is exceeded more than once per year on average over 3 years
Particulate matter (PM-2.5)	Annual arithmetic mean	15 $\mu g/m^3$	Same as Primary Standard	If the 3-year average of the weighted annual mean concentration exceeds the standard
	24-hour average	35 $\mu g/m^3$		If the 3-year average of the 98th percentile of 24-hour concentrations exceeds the standard
Sulfur dioxide (SO_2) (2)	Annual arithmetic mean	0.030 ppm	No standard	If annual average exceeds the standard in a calendar year
	24-hour average	0.14 ppm	No standard	If standard is exceeded more than once per year
	3-hour average	No standard	0.5 ppm	If standard is exceeded more than once per year
	1-hour average	75 ppb	No standard	If the 3-year average of the annual 99th percentile of the daily maximum 1-hour concentration exceeds the standard

Source: EPA 2012a
$\mu g/m^3$ = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards
PM-10 = particulate matter less than 10 micrometers
PM-2.5 = particulate matter less than 2.5 micrometers
ppm = parts per million

(1) On February 9, 2010, EPA published a new primary 1-hour NO_2 standard at the level 0.10 ppm (EPA 2010a). On April 3, 2012, the EPA reaffirmed the existing secondary standard for NO_2 (same as annual standard), choosing not to add an additional 1-hour secondary standard (EPA 2012b).

(2) On June 22, 2010, EPA published a new primary 1-hour SO_2 standard, effective August 23, 2010 (EPA 2010b). The EPA also revoked both the existing 24-hour SO_2 standards of 0.14 ppm and the annual primary SO_2 standard of 0.030 ppm, effective August 23, 2010. On April 3, 2012, the EPA reaffirmed the existing secondary standard for SO_2 (3-hour average), choosing not to add an additional 1-hour secondary standard (EPA 2012b).

The CAA also specifies future dates for achieving compliance with the NAAQS and mandates that states submit and implement a state implementation plan for local areas not meeting these standards (nonattainment areas). These plans must include pollution control measures and demonstrate through modeling that the standards would be met by the specified attainment date. Once a nonattainment area has achieved the NAAQS for a given pollutant, it can be redesignated as an attainment/maintenance area, which is subject to maintenance plans itemizing how the area would continue to meet the NAAQS.

The local area of interest for this action is the SFBAAB, which includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara counties, the southern portion of Sonoma County, and the southwestern portion of Solano County. Table 4.6-2 presents the federal attainment status of the SFBAAB.

Table 4.6-2. Federal SFBAAB Attainment Status

Pollutant	NAAQS Attainment Status
Carbon monoxide (CO)	Attainment (maintenance)
Lead (Pb)	Unclassifiable/Attainment
Nitrogen dioxide (NO_2)[(1)]	Attainment
Ozone (O_3)	Nonattainment (marginal)
Particulate matter (PM-10)	Unclassifiable[(2)]
Particulate matter (PM-2.5)	Nonattainment (for the 24-hour standard)
Sulfur dioxide (SO_2)[(1)]	Attainment

Source: EPA 2012c
[(1)] Pending final EPA designation for 2010 1-hour NAAQS for NO_2 and SO_2.
[(2)] Treated as attainment.

4.6.1.1.2 General Conformity

On November 30, 1993, EPA promulgated a set of regulations, known as the general conformity rule that included procedures and criteria for determining whether a proposed federal action would conform to the applicable state implementation plans. The purpose of the general conformity rule is to ensure that federal activities do not cause or contribute to new violations of the NAAQS, ensure that actions do not cause additional or worsen existing violations of or contribute to new violations of the NAAQS, and ensure that attainment of the NAAQS is not delayed.

Before any approval is given for a federal action, an applicability analysis must be conducted to see whether a conformity determination is required. According to the applicability analysis, the general conformity regulations would apply for all federal actions except those that are:

- Covered by transportation conformity
- Have emissions clearly at or below *de minimis* levels
- Classified as an exempt action in the rule
- Covered by a presumed-to-conform approved list

EPA created *de minimis* emission levels to limit the need to conduct conformity determinations for federal projects with minimal emission increases. EPA created *de minimis* emission levels for each criteria pollutant, and the *de minimis* levels for any project are based on the attainment status of the project area. When the total direct and indirect emissions from a proposed project are below the *de minimis* levels, the project would not be subject to a conformity determination. Table 4.6-3 presents the *de minimis* levels applicable to the project areas.

Table 4.6-3. General Conformity *de minimis* Levels

Pollutant	Area Type	Tons/Year
CO	Maintenance	100
Ozone	Marginal nonattainment outside an ozone transport region:(1)	
	NOx(1)	100
	VOC(1)	100
PM-10(2)	Attainment	NA
PM-2.5	Nonattainment:(3)	
	PM-2.5 direct emissions	100
	NOx(3)	100
	VOC(3)	100
	SOx(3)	100
	NH_3(3,4)	100
SO_2(2)	Attainment	NA

Source: EPA 2012c and EPA 2011a
NA = not applicable
NH_3 = ammonia
NOx = nitrogen oxides
SOx = sulfur oxides
VOC = volatile organic compounds
(1) NOx and VOC are precursors of ozone formation.
(2) General conformity *de minimis* levels are available for nonattainment pollutants. Since the region is in attainment for PM-10 and SO_2, these pollutants do not have *de minimis* levels.
(3) In addition to direct PM-2.5 emissions, NOx, VOC, SOx, and NH_3 emissions are precursors of PM-2.5 formation.
(4) Emission factors for NH_3 are substantially lower than those for PM-2.5 and NOx from combustion sources. Therefore, NH_3 emissions would not be quantified unless PM-2.5 and NOx emissions exceed the significance thresholds defined in Table 4.6-4.

4.6.1.1.3 Proposed Significance Thresholds for Air Quality

Because the proposed and actions under review in this EIS occur in a region designated as non-attainment or maintenance for several pollutants, a General Conformity applicability analysis is required. Direct and indirect equipment and vehicle emissions must be quantified to determine whether the proposed and connected actions would exceed the General Conformity *de minimis* thresholds for the nonattainment and maintenance pollutants. If the annual emissions of a given pollutant associated with the proposed action exceeds the General Conformity *de minimis* threshold (shown in Table 4.6-3), a General Conformity determination analysis must be conducted for the project.

The General Conformity *de minimis* thresholds only apply to pollutants that have been designated as non-attainment or maintenance for a given area or region. Another threshold must

be used to set significance thresholds for attainment pollutants. Noting that the General Conformity *de minimis* thresholds are equal to EPA's definition of major stationary sources in non-attainment areas (40 CFR 51.165(a)(1)(iv)(*1*)), the definition of a major stationary source in an attainment area (40 CFR 52.21(b)(1)(i)) under the Prevention of Significant Deterioration (PSD) program is proposed as the significance threshold for attainment pollutants. Since these thresholds were developed for stationary sources that could operate at a single location for decades, these thresholds would be conservative for the temporary activities associated with proposed and connected actions and the no action alternative. It could be reasonably assumed that the impact from sources with emissions less than these thresholds would not be significant. Table 4.6-4 presents the significance thresholds for each criteria pollutant for this analysis.

Table 4.6-4. Significant Emission Thresholds

Pollutant[(1)]	Attainment Status	Threshold Type	Significance Threshold, tons per year
Carbon monoxide (CO)	Attainment-Maintenance	General Conformity *de minimis*	100
Nitrogen dioxide (NO_2)	Attainment	PSD major source	100[(2)]
Ozone:	Nonattainment-Marginal		
- Oxides of nitrogen (NOx)	(as O_3 precursor)	General Conformity *de minimis*	100
- Volatile organic compounds (VOC)	(as O_3 precursor)	General Conformity *de minimis*	100
Respirable particulate matter (PM-10)	Unclassifiable	PSD major source	100[(2)]
Fine particulate matter (PM-2.5)	Nonattainment	General Conformity *de minimis*	100
Sulfur dioxide (SO_2)	Attainment	PSD major source	100[(2)]

Sources: EPA 2012c and EPA 2012d.

(1) Lead is not emitted by any sources associated with the proposed action; therefore, lead is not included in the air quality impact analysis.

2) The PSD definition of a major source has two categories: specifically defined facilities listed in 40 CFR 52.21(b)(1)(i)(*a*) which are given a major source emission rate of 100 tons per year and all other facilities, which are given a major source emission rate of 250 tons per year (40 CFR 52.21(b)(1)(i)(*b*)). To be conservative, the lower threshold is used for this analysis.

4.6.1.2 Hazardous Air Pollutants

Toxic air pollutants, also known as hazardous air pollutants (HAPs), are pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. The EPA has identified 187 toxic pollutants that have been classified as HAPs. Examples of common HAPs include benzene, perchloroethlyene, methylene chloride, dioxin, asbestos, toluene, and metals, such as cadmium, mercury, chromium, and lead compounds. People exposed to HAPs at sufficient concentrations and durations may have an increased chance of developing cancer or experiencing other serious health effects (EPA 2011b).

HAPs are not considered criteria air pollutants and thus are not specifically addressed through the setting of ambient air quality standards. Instead, EPA regulates HAPs through statutes and regulations that generally require the use of the maximum or best available control technology to

limit emissions. The CAA requires EPA to promulgate vehicle or fuel standards containing reasonable requirements that control toxic emissions. At a minimum, benzene and formaldehyde emissions should be controlled by EPA vehicle and fuel standards. Performance criteria were established to limit mobile-source emissions of toxics, including benzene, formaldehyde, and 1,3 butadiene (Bay Area Air Quality Management District [BAAQMD] 2011).

4.6.2 Existing Conditions

The existing air quality and meteorological conditions in the East Bay Hills were developed from monitoring data collected by regulatory agencies at air quality and meteorology stations near the proposed action.

4.6.2.1 Meteorology and Climate

Air quality in the SFBAAB is affected by a combination of natural factors, such as topography, meteorology, and climate, in addition to the contribution of local air pollution sources and existing regional ambient air quality.

The SFBAAB is characterized by complex terrain, consisting of coastal mountain ranges, inland valleys, and bays, which effect normal wind flow patterns. The Coast Range splits, resulting in a western coast gap called Golden Gate and an eastern coast gap called Carquinez Strait, which allows air to flow in and out of the SFBAAB and California's Central Valley. The greatest impact to air quality occurs when low-level inversions are present and the air beneath the inversion flows independently of air above the inversion, a condition that is common in the summer.

The urbanized areas of the SFBAAB are included in one of 11 climatological subregions. The proposed project area is located in the climatological subregion that covers Northern Alameda and Western Contra Costa counties. This climatological subregion stretches from Richmond to San Leandro. Its western boundary is defined by the San Francisco Bay (Bay) and its eastern boundary defined by the Oakland-Berkeley Hills. The Oakland-Berkeley Hills have a ridge line height of approximately 1,500 feet and is a significant barrier to air flow to the east. The most densely populated area of the subregion lies in a strip of land between the Bay and the lower hills of Oakland-Berkeley.

In the proposed project area, marine air traveling through the Golden Gate, as well as across San Francisco and through the San Bruno Gap, has a dominant influence on the weather pattern. The Oakland-Berkeley Hills cause the westerly flow of air to split off to the north and south of Oakland, which results in diminished wind speeds. The prevailing winds for most of this subregion are from the west. At the northern end, near Richmond, prevailing winds are from the south-southwest.

Temperatures in this subregion have a narrow range because of the proximity of the moderating marine air. Average maximum temperatures during summer are in the mid-70s, with minimums in the mid-50s. Winter highs are in the mid- to high-50s, with lows in the low- to mid-40s.

The air pollution potential[3] is lowest for the parts of the subregion that are closest to the Bay, due largely to good ventilation and less influx of pollutants from upwind sources. The occurrence of light winds in the evenings and early mornings occasionally causes elevated pollutant levels.

The air pollution potential at the northern (Richmond) and southern (Oakland, San Leandro) parts of this subregion is marginally higher than communities directly east of the Golden Gate, because of the lower frequency of strong winds.

This subregion contains a variety of industrial air pollution sources. Some industries are quite close to residential areas. The subregion is also traversed by frequently congested major freeways. Traffic and congestion, and the motor vehicle emissions they generate, are increasing (BAAQMD 2010).

4.6.2.2 Existing Ambient Air Quality

The EPA and the California Air Resources Board (CARB) maintain ambient air monitoring stations for criteria pollutants throughout California. The data from several air quality monitoring stations, each of which is considered to provide representative data for some criteria air pollutants and/or some portion of the project area, are presented below.

The nearest ambient air quality monitoring stations to the proposed project areas are in Alameda County. The air quality values from Alameda County are summarized in Table 4.6-5 for the most recent 3 years of available data. These stations monitor CO, O_3, NO_2, SO_2, PM-10 and PM-2.5, and meteorological parameters. These stations were selected to best represent the existing regional air quality conditions of the project area. The concentrations presented in Table 4.6-5 are the design values[4], the values to be compared to the NAAQS described in Table 4.6-1. Review of the monitoring data shows that the CO, NO_2, SO_2, PM-10, and PM-2.5 concentrations monitored at the selected stations were below the NAAQS for 2009 through 2011.

The recorded 8-hour O_3 concentrations continue to exceed the NAAQS in 2009 through 2011 at one monitoring station in Alameda County. Ozone concentrations at the other monitoring stations did not exceed the 8-hour O_3 NAAQS during that same period. Because the area exceeded the standard by a nominal amount, the project area has been designated as marginal nonattainment for the 8-hour O_3 standard, as indicated in Table 4.6-2.

While the design values for the 24-hour PM-2.5 concentrations did not exceed the NAAQS for the 2009 to 2011 period, the standard was exceeded in the greater San Francisco area in prior years resulting in the nonattainment designation noted in Table 4.6-2.

[3] The air pollution potential for a given pollutant is based upon the quantity of pollutants emitted into the atmosphere in the surrounding area or upwind and the ability of the atmosphere to disperse the contaminated air.

[4] Design values are the metrics (statistics) that are compared to the NAAQS levels to determine compliance. The design values are determined following procedures incorporated in the NAAQS regulations at 40 CFR 50, including the appendices.

Table 4.6-5. Summary of Pollutant Monitoring Data near Project Area

Air Pollutant	Monitored Ambient Concentration[2]	Max. Values for Alameda County[1]			NAAQS
		2009	2010	2011	
Carbon monoxide (CO)	Design Values for 1-hour Concentrations (ppm)	3.3	2.7	3.7	35
	Design Values for 8-hour Concentrations (ppm)	1.9	1.7	2.6	9
Lead (Pb)	Mean 24-hour Concentrations (µg/m^3)	0.01	0.02	NM	0.15[3]
Nitrogen dioxide (NO_2)	Design Values for 1-hour Concentrations (ppb)	50	54	50	100
	Design Values for Annual Concentrations (ppb)	16	16	16	53
Ozone (O_3)	Design Values for 8-hour Concentrations (ppm)	**0.078**[4]	**0.080**[4]	**0.076**[4]	0.075
Respirable particulate matter (PM-10)	Design Values for 24-hour Concentrations (µg/m^3)	31	40	NM[5]	150
Fine particulate matter (PM-2.5)	Design Values for 24-hour Concentrations (µg/m^3)	34	30	28	35
	Design Values for Annual Concentrations (µg/m^3)	9.4	9.0	9.1	15
Sulfur dioxide (SO_2)	Design Values for 1-hour Concentrations (ppb)	13	10	14	75
	Design Values for 24-hour Concentrations (ppb)	5	4	3	140

Sources: EPA 2012e and CARB 2012

µg/m^3 = micrograms per cubic meter
NA = not applicable
NM = not monitored
ppb – part per billion by volume
ppm = parts per million by volume

(1) Includes data from monitoring stations in Berkeley, Fremont, Hayward, Livermore, and Oakland.
(2) Design values are calculated from monitored data following procedures incorporated into the NAAQS regulations at 40 CFR 50, including appendices.
(3) The NAAQS for Pb is 0.15 µg/m^3 for a 3-month rolling average. The standard is met if mean daily concentrations are less than this value.
(4) Values in **Bold** are above the applicable standard.
(5) No measurements available in Alameda County. The design value for 24-hour average concentrations in the greater San Francisco area was 44 µg/m^3 in 2011 (EPA 2012e).

4.6.2.3 Sensitive Receptors

Some locations are considered more sensitive to adverse effects from air pollution than others. These locations are termed sensitive receptors. A sensitive receptor is generically defined as a location where human populations, especially children, seniors, and sick persons, are found, and the averaging period for the ambient air quality standard (e.g., 24-hour, 8-hour, 1-hour) supports a reasonable expectation of continuous human exposure. Sensitive receptors typically are any residence, including private homes, condominiums, apartments, and living quarters; education resources, such as preschools and kindergarten through grade 12 schools; daycare centers; health care facilities, including hospitals, retirement homes, and nursing homes; parks and/or

playgrounds; and places of worship. Sensitive receptors around the project area are mostly residential units, but there are some schools, hospitals, parks/playgrounds, and places of worship.

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4.7 Climate and Microclimate

This section presents a brief summary of the current regulatory setting and information on existing climate and climate change conditions in the East Bay Hills. The existing conditions evaluation focuses on carbon sequestration, regional climate, and microclimate in the East Bay Hills, as well as on estimated current and future changes in climate parameters (such as temperature and precipitation) in the San Francisco Bay region. The impact analysis included in Section 5.6 addresses the proposed and connected action impacts on climate change, as measured by changes in greenhouse gas (GHG) emissions, along with potential changes to microclimate. That section also provides a brief assessment of the effects that climate change may have on the project area.

4.7.1 Regulatory Setting

The relevant regulatory context and Executive Orders that frame the discussion of carbon sequestration and vegetation and NEPA's guidance background are discussed below.

On October 5, 2009, Executive Order 13514, Federal Leadership in Environmental, Energy and Economic Performance, was signed by the President. The Executive Order requires federal agencies to set a 2020 GHG emissions reduction target. On October 6, 2010, the Council on Environmental Quality (CEQ) released final guidelines for Executive Order 13514 for how federal agencies must catalog climate-changing pollutants that result from federal operations. The guidance establishes reporting requirements for GHG emissions. Federal agencies are required to create inventories of GHG emissions by January 31, 2011 under Executive Order 13514. The inventory must include emissions of carbon dioxide, methane, nitrous oxide, hydroflorocarbons, perflurocarbon gases, and sulfur hexafluorides (CEQ 2012).

On February 18, 2010, the CEQ released draft guidance on the consideration of GHG in federally proposed actions. The draft guidelines include a presumptive threshold of 25,000 metric tons of carbon dioxide equivalent (CO_2e) emissions from a proposed action to trigger a quantitative analysis. However, the document does not provide guidance on when to determine GHG emissions are "significant" for NEPA purposes but rather poses the question to the public (CEQ 2010).

There are no federal or state laws or regulations regarding microclimate.

4.7.2 Methodology

4.7.2.1 Carbon Sequestration

Existing conditions for this analysis is based on estimates of current carbon sequestration[1] in the areas that would be disturbed by the proposed action. Forests are large reservoirs of carbon as well as potential carbon sinks[2] and sources to the atmosphere. In the United States, forest carbon

[1] Carbon sequestration is the process of capture and long-term storage of atmospheric carbon dioxide (CO_2).

[2] A carbon sink is a natural or artificial reservoir that accumulates and stores some carbon-containing chemical compound for an indefinite period. Carbon sinks remove CO_2 from the atmosphere through the carbon sequestration process.

sinks (including live and dead trees, understory, forest floor and soils, wood products, and landfilled wood) have been estimated to sequester 159 teragrams (Tg) of carbon during 2005, offsetting approximately 10% of the U.S. fossil fuel CO_2 emissions for the same year (Woodbury et al. 2007). This carbon sink associated with the project area must be quantified to determine how the project would affect greenhouse gas emissions.

The current above-ground carbon sinks associated with the vegetation in the project area were measured using a combination of remotely sensed and ground-based data. The carbon content was investigated for the live and dead standing tree carbon pools[3]. Carbon content was analyzed for the oak-bay, redwood, conifer, and eucalyptus forest types. In addition, known carbon equations were used to estimate the above-ground carbon contained in California annual grassland, coastal scrub, and coyote brush scrub. Existing aerial imagery and vegetation maps (e.g., EBRP's vegetation maps) were used to delineate the area, extent, and boundaries of the vegetation classes. Acreages of vegetation classes were derived based on polygon sizes for different vegetation types.

To measure stand structure and stand composition in the project area, field surveys were conducted between February 8 and 11, 2011. To capture the variability within vegetation types, three plots were randomly selected in three of the four types listed above. Because of the relative lack of heterogeneity in redwood forests of the project area, only one plot was established in this forest type. A total of 10 plots were established.

Fixed area plots with an area of 0.10 acre and a radius of 37.2 feet (ft) were used. Data were collected in each plot as follows: diameter and species were taken on all live and dead standing stems greater than 5 inches diameter at breast height (DBH). DBH values were taken outside of the bark. A single height measurement was recorded per plot to represent the highest tree strata. In addition, canopy closure (0, 25, 50, 75, or 100% cover were estimated by sight) was taken. Slope, aspect, and elevation were recorded at plot center. Forest floor carbon data (including downed woody debris, litter, and duff) were also taken but were not used in this analysis.

The tree species found in the 10 vegetation plots were blue gum eucalyptus (*Eucalyptus globulus*), Monterey pine (*Pinus radiata*), California bay-laurel (*Umbellularia californica*), coast live oak (*Quercus agrifolia*), and coast redwood (*Sequoia sempevirens*).

4.7.2.1.1 Volume, Biomass, and Carbon Calculations

Table 4.7-1 shows the results of field surveys in terms of wood volume, biomass, and carbon content for the forested plots in the project area. Volume, biomass, and carbon calculations are described below.

[3] Carbon pools are the carbon storage reservoirs for the planet and include the atmosphere, oceans, lithosphere (primarily soils and sediment), and terrestrial biosphere (primarily vegetation).

Table 4.7-1. Above-Ground Live and Dead Standing Tree Volume, Biomass, Carbon Content, and CO_2e Content by Vegetation Type and Species

Vegetation Type	Plot No.	Species	Volume (cf/acre)	Biomass (tons/acre)	Carbon Content (ton/acre)	Total CO_2 (metric tons/acre)	Average CO_2e (metric tons/acre)	
							Live wood	Deadwood
EUC	1	EUGL	11638.59	290.50	145.25	533.07	326.91	5.62
EUC	2	EUGL	5502.47	137.34	68.67	252.02		
EUC	8	EUGL	4133.15	103.16	51.58	189.30		
EUC	8	PIRA	315.62	3.45	1.72	6.32		
EUC	1	Dead EUGL	253.35	6.32	3.16	11.60		
EUC	2	Dead EUGL	71.25	1.78	0.89	3.26		
EUC	8	Dead EUGL	43.41	1.08	0.54	1.99		
CF	3	PIRA	12052.10	131.61	65.80	241.50	184.61	0.81
CF	3	UMCA	20.11	0.37	0.19	0.68		
CF	4	PIRA	9832.06	107.61	53.81	197.47		
CF	6	PIRA	5493.75	60.13	30.06	110.34		
CF	6	UMCA	16.52	0.30	0.15	0.56		
CF	6	QUAG	71.68	1.79	0.89	3.28		
CF	3	Dead PIRA	120.38	1.32	0.66	2.42		
OW	5	UMCA	49.58	0.91	0.46	1.67	8.97	0.07
OW	5	QUAG	72.31	1.80	0.90	3.31		
OW	9	UMCA	93.35	1.72	0.86	3.15		
OW	9	QUAG	84.48	2.11	1.05	3.87		
OW	10	UMCA	66.22	1.22	0.61	2.24		
OW	10	EUGL	150.74	3.76	1.88	6.90		
OW	10	QUAG	125.99	3.14	1.57	5.77		
OW	9	Dead UMCA	6.04	0.11	0.06	0.20		
RDWD	7	UMCA	1.32	0.01	0.01	0.03	414.84	0
RDWD	7	SESE	21305.79	226.05	113.03	414.81		

Notes: cf = cubic feet; CO2 = carbon dioxide; CO2e = carbon dioxide equivalent

Vegetation types

EUC= Eucalyptus forest
CF=Non-native coniferous forest
OW= oak-bay forest
RDWD=redwood forest

Species

EUGL= *Eucalyptus globulus* (blue gum eucalyptus)
PIRA= *Pinus radiata* (Monterey pine)
QUAG= Quercus agrifolia (coast live oak)
SESE= *Sequoia sempevirens* (coast redwood)
UMCA= *Umbellularia californica* (California bay-laurel)

Volumes

Volumetric values were calculated in cubic feet (cf) from DBH values using local volume equations as follows:

$$\text{Vol (cf)} = a\,(\text{DBH}^{b}) \qquad (1)$$

Where:

a and *b* are known species-specific regression coefficients

The following volume equations are derived from Pillsbury and Reimer (1997):

Blue gum eucalyptus:

$$\text{Vol (cf)} = 0.055113\,(\text{DBH}^{2.436970}) \qquad (2)$$

Monterey pine:

$$\text{Vol (cf)} = 0.019874\ (\text{DBH}^{2.666079}) \quad (3)$$

The following volume equations for coast live oak and California bay laurel are derived from Pillsbury and Kirkley (1984):

Coast live oak:

$$\text{Vol (cf)} = 0.0065261029\ (\text{DBH}^{2.31958}) \quad (4)$$

California bay laurel:

$$\text{Vol (cf)} = 0.0057821322\ (\text{DBH}^{1.94553}) \quad (5)$$

The following volume equation for coast redwood was derived from Krumland and Wensel (1975):

$$\text{Vol (cf)} = \exp\ (-6.2597 + 1.9967 \times \ln (\text{DBH}) + 0.9642 \times \ln (\text{HT})) \quad (6)$$

Biomass

Live and dead standing tree biomass was converted from volumes using the U.S. Forest Service's (USFS) Forest Inventory Analysis (FIA) regional species-specific equations for biomass (USFS 2009), which are also used for the California Forest Protocols under California's Assembly Bill 32 (AB 32), the Global Warming Solutions Act. These biomass equations provide estimates for bark stem wood and do not include the biomass of bark or branches.

Tree stem biomass, regardless of merchantability as a tree trunk or total stem, was calculated from cubic volume estimates and the wood density factors as follows:

$$\text{Wood density} = (\text{Specific Gravity}) * (62.4\ \text{pounds/cf}) \quad (7)$$

Where:

Weight of water = 62.4 pounds/cf

Biomass of the tree stem (in tons) = (Volume * Wood Density)/2000

FIA's wood density values for the relevant tree species in the project area are as follows:

- For coast live oak: 49.92 pound/cf
- For eucalyptus: 49.92 pound/cf
- For coast redwood: 21.22 pound/cf
- For bay laurel: 36.82 pound/cf
- For Monterey pine: 21.84 pound/cf

Carbon Content

The biomass to carbon conversion factor most commonly used is to half the biomass estimates as follows:

$$\text{Carbon content} = \text{biomass of tree stem (in tons/acre)} \times 0.5 \quad (8)$$

Once carbon content was derived, the total metric tons of carbon dioxide (CO_2) or carbon dioxide equivalent (CO_2e) were calculated by multiplying carbon by 3.67, the molecular weight ratio of CO_2 to C (CRC Press 1979). The average carbon per acre for the grass and shrub types was estimated using the Scott and Burgan (2005) fuel models. California annual grassland was estimated using fuel model GR4 (2.15 tons/acre), coastal scrub as fuel model SH1 (1.95 tons/acre), and coyote brush scrub as fuel model SH2 (8.35 tons/acre). The live-to-dead fuel ratio for coastal scrub and coyote brush scrub was based on an average of values previously obtained by Rice and Martin (1985) for northern coastal scrub collected in the East Bay Hills. The tons of biomass were converted to metric tons of carbon per acre by dividing by 1.1023 and multiplying by 0.5. Carbon was converted to CO_2e by multiplying by 3.67.

Carbon values were scaled up to the project area using acreages calculated using areal imagery and existing vegetation maps (Table 4.7-2). The carbon content results are exhibited in Table 4.7-3.

Table 4.7-2. Acreage Values of Vegetation Types in the Proposed Project Areas

Vegetation Type	Area (acres)
Eucalyptus forest	189.45
Non-native coniferous forest	36.71
Oak-bay forest	228.09
Redwood forest	6.58
California annual grassland	1093.62
Coastal scrub	167.90
Coyote brush scrub	158.04

Table 4.7-3. Total CO_2e Sequestered by Vegetation Type and Live Versus Dead Standing Wood in the Proposed Project Areas

Vegetation Type	Total CO_2e live	Total CO_2e dead	Total CO_2e
Eucalyptus forest	61,932	1,064	62,997
Non-native coniferous forest	6,777	30	6,807
Oak-bay forest	2,047	16	2,062
Redwood forest	2,730	0	2,730
California annual grassland	NA	NA	3,914
Coastal scrub	256	289	545
Coyote brush scrub	1,033	1,164	2,197
Total (metric tons)	**74,775**	**2,563**	**81,252**

4.7.2.2 Climate and Microclimate

Existing conditions for this analysis is based on descriptions of the existing regional climate and microclimate associated with the proposed project areas.

4.7.2.3 Climate Change

Existing conditions for this analysis would be based on reports prepared by the U.S. Global Climate Change Research Program, EPA, and the California Energy Commission (CEC).

4.7.3 Existing Conditions

4.7.3.1 Existing Conditions for Sequestered Carbon

The results of the analysis show that approximately 78,600 metric tons of CO_2e are stored in the trees (including dead standing), shrubs, and grasses of the project area. Of these, roughly 73,485 metric tons are stored in the live trees and 1,109 metric tons in the dead standing trees. Given the relatively high biomass of blue gum eucalyptus combined with the relatively high acreage of proposed cutting of the eucalyptus vegetation type, this vegetation type constitutes approximately 80% of the carbon currently stored by vegetation in the project area.

These results constitute a conservative estimate of carbon stored by vegetation in the project area. If below-ground carbon and forest floor carbon were included, the estimates would increase.

4.7.3.2 Existing Conditions for Regional Climate

Climate is the multi-year, long-term average of daily weather cycles that occur over a large geographical area. Regional climate is the average long-term weather cycles over a smaller and more specific area. Often, these smaller areas are defined by air basins in which air currents may normally flow freely until confronted by elevated terrain or air mass differences from other basins. Regional climate could be affected by large-scale changes in the atmosphere, not small-scale, local changes in vegetation cover or short-term weather changes.

The climate of the San Francisco Bay region, along with much of coastal California, is controlled by a semi-permanent high-pressure system that is centered over the northeastern Pacific Ocean. Beginning in the autumn and continuing through the winter, the high-pressure system weakens and moves south, allowing storm systems originating from the Gulf of Alaska and the Pacific Ocean into the area. Temperature, winds, and rainfall are more variable during these months.

Over the northern three-fourths of the state, there are two primary mountain chains paralleling the coast while in the southern one-fourth there is only one. Isotherms (a line drawn on a weather map or chart linking all points of equal or constant temperature) run mostly north-south, parallel to the contours of the mountains, instead of east-west as is common in most parts of the temperate zone (between approximately 24 and 66° North or South latitude). Along the western side of the Coast Range, the climate is dominated by the Pacific Ocean. Warm winters, cool summers, small daily and seasonal temperature ranges, and high relative humidity are characteristic of this area. With increasing distance from the ocean, the maritime influence decreases. Areas that are well protected from the ocean experience a more continental type of

climate with warmer summers, colder winters, greater daily and seasonal temperature ranges, and generally lower relative humidity. Many parts of California are in a transitional zone where conditions range between these two climatic conditions.

The Pacific high-pressure system decreases in intensity in the winter and moves farther south, allowing storms to move into and across the state, producing widespread rain at low elevations and snow at high elevations. Occasionally the broad-scale circulation pattern permits a series of storm centers to move into California from the southwest. This type of storm pattern is responsible for occasional heavy rains that may cause serious flooding (Gale Research 1985).

4.7.3.2.1 Regional Wind Velocity and Directional Patterns

The prevailing wind direction at the Oakland International Airport is westerly for all months except December and January when the wind most frequently blows from the southeast (Western Regional Climate Center [WRCC] 1992-2002 data) (WRCC 2011a). On average, the wind speed is around 9 miles per hour (mph), with lower wind speeds in the winter and higher wind speeds in the summer. Table 4.7-4 presents wind data from Oakland airport.

Closer to the proposed and connected project areas are several weather stations operated by the EBRPD Fire-Rescue Services and Oakland Fire Services Agency. The nearest stations are Oakland North (ONO) and Oakland South (OSO). The ONO station is just east of Claremont Hills, at the north edge of the North Hills-Skyline-PDM polygon, off Grizzly Peak Road. The OSO station is near the AC005 polygon of Anthony Chabot Regional Park, off Skyline Boulevard. Average wind speed and direction data for these stations are included in Table 4.7-4.

Table 4.7-4. Monthly Wind Direction and Speed Summary for Oakland, California

	Month												
Wind Direction/Speed	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Oakland International Airport													
Wind direction (from)(1)	SE	W	W	W	W	W	W	W	W	W	W	SE	W
Wind speed (mph)(2)	6.8	8.3	9.0	10.4	10.4	10.4	10.2	9.6	8.5	7.5	7.0	7.6	8.8
Oakland North (ONO)													
Wind direction (from)(3)	NE	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	NE	NE	SSW
Wind speed (mph)(3)	10.2	7.8	6.6	6.7	7.8	7.4	7.6	7.3	5.8	7.0	8.2	8.7	7.6
Oakland South (OSO)													
Wind direction (from)(4)	N	SW	SW	SW	SW	SW	SW	SW	SW	SW	NNE	NNE	SW
Wind speed (mph)(4)	6.5	5.5	5.7	6.2	7.0	6.8	7.6	7.5	5.2	5.0	5.3	4.8	6.0

Source: WRCC 2011a, EBRPD 2012f, DWR 2012b.

(1) Prevailing wind direction is based on the hourly data from between 1992 and 2002 and is defined as the direction with the highest percent of frequency.

(2) Average wind speeds are based on the hourly data from between 1996 and 2006.

(3) Average wind direction and wind speeds are based on hourly data from 2007 through 2011.

(4) Average wind direction and wind speeds are based on hourly data from October 6, 2009 through 2011.

The strong westerly winds at Oakland International Airport are caused by the combination of high pressure offshore and a thermal low pressure resulting from higher temperatures inland. In the East Bay Hills, wind speeds and directions vary from the data recorded at the airport. Moving inland and upslope from the airport, the prevailing wind direction shifts from west to the southwest at OSO and to the south-southwest at ONO.

Regional wind speed and wind direction are typically driven by large-scale influences. In the Northern Hemisphere, high pressure systems have winds rotating clockwise. So when the center of the semi-permanent Pacific high is off the central or southern California coast, the “top” of this system is in the northern California area and the winds therefore generally blow from the west.

There are also daily (diurnal) wind patterns that occur around elevated terrain. In the morning, the sun warms the air at the surface causing it to expand and rise vertically. The atmosphere near the elevated terrain is slightly less dense because it is higher in elevation. Since this air is slightly less dense and frequently dryer than the air at sea level, it heats up quicker and rises sooner than air at sea level. The atmosphere tries to balance between areas of low pressure and a high pressure. Thus, winds flow from higher pressure areas (sea level) to lower pressure areas (toward the mountains). This pattern is called upslope winds, or when the wind tends to blow “up the slope” of the mountains. Upslope wind velocities from this solar heating seldom exceed between 8 and 10 mph at a 20-ft measurement height. The velocity profile of upslope winds, relative to the height above ground, typically have a maximum value between 65 and 130 ft above the surface (Oke 1987; Rothermel 1983). In the evening, the wind pattern is reversed. The air in elevated terrain is frequently drier and therefore cools much quicker than air near sea level. As air cools, it tends to get denser. The air near sea level is warmer than the air in the mountains so the colder air starts flowing downhill because it is denser than the slightly warmer air at sea level. This pattern is called downslope winds. Downslope winds are very shallow with slower wind speeds than upslope winds (Rothermel 1983). Both of these wind patterns are fairly short-lived because the temperature differences in the atmosphere generally do not last more than a few hours.

Areas adjacent to large bodies of water have another mechanism that affects local wind patterns, especially in the winter. Water and soil heat and cool at different rates, and the air over each type likewise changes temperature differently. There are onshore and offshore wind patterns that are created by temperature differences at the surface, very similar to the upslope and downslope wind patterns. In the morning, the land heats quicker than the water causing the air over the land to heat, expand, and rise. This creates an area of lower pressure over land and causes air to move from the water to the land at the surface, or onshore wind, also called a sea breeze. In the evening, the land cools quicker than the water, causing the air over the land to cool, get denser, and flow toward the water; thus, offshore winds create a land breeze. The sea breeze, land breeze flow pattern is often the primary wind pattern mechanism in coastal California and can be interrupted by high and low pressure systems, frontal passages, and associated storms.

The change in heating and cooling rates between land and water can be an issue in the winter when inversions frequently form. Air typically cools with increasing altitude in the lower atmosphere (troposphere). A subsidence (or capping) inversion is formed when a mass of air

descends and warms as it sinks toward the ground. The sinking air mass almost never continues downward to the surface because there is always some, however slight, turbulent mixing taking place, keeping the air below the inversion cooler. The layers above and below the inversion are usually quite unstable while the inversion layer itself is very stable and may be quite thick. The warm air retards vertical air movement, acting as a cap. A capping inversion may last for some time depending on the depth of the warmer air aloft.

The most frequent inversion is called a radiation (or nocturnal) inversion. The ground cools much quicker than the air, which in turn cools the air near to the ground. But the air above this surface air is slower to cool. On calm nights, when the wind is not stirring up the air masses, the air close to the ground can grow quite cool compared with the air above, creating a “nocturnal” (because this happens at night), or “radiation” inversion because heat is radiating away from the ground much quicker than from the layer of air above the surface air layer. This inversion usually would last until mid-morning once the sun has heated the air at the surface, and it becomes warmer and more buoyant than the warmed air above.

The last inversion type is frequent to coastal areas of California. Sea breeze inversions occur along windward coasts bordered by cold ocean currents. The bottom layer of a warm maritime air mass originating over the ocean becomes cooler upon coming in contact with the cooler water bordering the coast. This creates cooler air near the surface with warmer air aloft. The air nearest to the inversion layer aloft is the coolest and has the most moisture and is where the stratus cloud layer first forms. This cloud layer may or may not reach the ground depending on the strength of the low level winds and how close the inversion layer is to the surface. All of these inversions tend to minimize wind movement vertically and horizontally to some degree, creating sometimes stagnant conditions.

In northern California (specifically the project area), lower wind speeds also tend to occur when a local high pressure system over the Central Valley intensifies. In the winter, when the semi-permanent Pacific high pressure system weakens and moves toward the south, low pressure systems frequently pass through the project area. The counterclockwise wind flow around low pressure systems creates an easterly flow, which is stronger during the winter months.

A Diablo wind, a local wind phenomenon, is a name that has been occasionally used for the hot, dry offshore wind from the northeast that typically occurs during the spring and fall. The Diablo winds are created by the combination of a strong high pressure system at the surface over the Great Basin, strongly sinking air aloft, and lower pressure off the California coast. This wind pattern is associated with the development of high atmospheric pressure inland (in the Central Valley or Great Basin) following the passage of storms just north and east of California. This hot and dry wind is somewhat related to the more commonly known Santa Ana winds that occur in Southern California. Additional discussion of wind speed by wind direction is included in Section 4.7.3.2.5 below.

4.7.3.2.2 Temperature

Temperatures are dependent on many factors, including, amount of sunshine, cloud cover, circulation patterns of high or low pressure systems, and wind speed and direction. In the basins and valleys adjoining the coast, climate is subject to wide variations within short distances as a

result of the influence of topography on the circulation of marine air. The San Francisco Bay area offers many varieties of climate within a few miles. In the greater Bay area, for example, the average maximum temperature in July is about 64° Fahrenheit (°F) at Half Moon Bay on the coast, 87° F at Walnut Creek only 25 miles inland, and 95° F at Tracy, just 50 miles inland (Gale Research 1985).

Long-term average temperature data have been collected at the Richmond (ID 047414), Berkeley (ID 040693), and Upper San Leandro (ID 049185) surface meteorological stations nearest to the project locations and are presented in Tables 4.7-5 to 4.7-7. For the Richmond and Berkeley stations, the average low and high temperatures during the summer range between the mid-50s and the low-70s, respectively (in °F). The Upper San Leandro station has a larger temperature range than the above-mentioned stations and is several degrees warmer on average during the summer months for the daytime high temperature and slightly cooler at night. During the winter, average low temperatures range between the low and mid 40s, and average high temperatures extend between the high 50s and low 60s for all stations.

The Richmond and Berkeley recording stations are both approximately between 0.5 and 2.8 miles from the Bay while the Upper San Leandro station is approximately 4.3 miles from the Bay. The Richmond and Berkeley stations are frequently under the influence of the cooler marine climate close to the Bay. The Upper San Leandro station is farther from the marine climate and may be high enough to be above it as well (approximately 350 feet); thus, the temperatures are slightly higher in the summer months.

Table 4.7-5. Monthly Temperature Summary for Richmond, California

	Month												
Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average max. temperature (°F)	57.5	61.4	63.8	66.4	68.9	71.1	70.4	71.1	74.1	72.2	64.6	58.1	66.6
Average min. temperature (°F)	42.6	45.4	46.8	48.8	51.7	54.4	55.3	56.1	56.3	53.2	48.0	43.4	50.2

Source: WRCC 2011b
Period of Record: 12/1/1950 to 9/30/2010
°F = Fahrenheit

Percent of possible observations for period of record
Maximum temperature: 97.5%
Minimum temperature: 97.4%

Table 4.7-6. Monthly Temperature Summary for Berkeley, California

	Month												
Parameter	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Average max. temperature(°F)	55.8	59.1	61.4	63.9	66.6	70.0	70.2	70.1	71.7	69.5	63.2	56.7	64.8
Average min. temperature (°F)	42.7	45.2	46.1	47.6	50.1	52.6	53.8	54.4	54.7	52.4	48.0	43.7	49.3

Source: WRCC 2011b
Period of Record: 1/1/1893 to 9/30/2010
°F = Fahrenheit

Percent of possible observations for period of record
Maximum temperature: 94.4%
Minimum temperature: 94.4%

Table 4.7-7. Monthly Temperature Summary for Upper San Leandro, California

Parameter	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average max. temperature (°F)	57.2	60.8	62.6	66.1	68.5	72.4	75.2	75.5	76.0	72.6	64.3	57.9	67.4
Average min. temperature (°F)	40.2	42.4	43.1	44.5	47.4	51.2	52.7	53.7	53.4	50.6	45.3	41.0	47.1

Source: WRCC 2011b
Period of Record: 7/1/1948 to 9/30/2010 °F = Fahrenheit
Percent of possible observations for period of record Maximum temperature: 59.5%
Minimum temperature: 59.7%

Additional discussion of ambient temperature averaged by wind direction for two of the EBRPD monitoring stations is presented in Section 4.7.3.2.5 below.

4.7.3.2.3 Moisture Parameters: Dewpoint, Humidity, and Precipitation

Summer is a dry period over most of California. With the northward migration of the semi-permanent Pacific high during summer, most storm tracks are deflected far to the north. California seldom receives summer precipitation from Pacific storms, and the relatively northern location of this strong high-pressure system results in clear skies inland and frequent coastal fog. Occasionally, however, the high pressure system can move slightly, allowing weather systems from the southwest to bring moist air northward during the summer from the Gulf of Mexico or the Gulf of California. At such times, scattered, locally heavy showers occur, but these events usually occur over the desert and mountain portions of California (Gale Research 1985). During the winter, oceanic low pressure systems propagate southward and bring the rainy season to the state.

As shown in Tables 4.7-8 through 4.7-10, the Richmond, Berkeley, and Upper San Leandro areas receive an average of between 23 and 25 inches of rain annually. About 80% of the precipitation in the area occurs from November through March, generally in association with storm systems that move through the region (WRCC 2011b).

Coastal fog is very frequent in California, especially in the summer months. The California current moves southward along the western U.S. coast, bringing cold water from the northern portions of the Pacific Ocean and Alaska. As warmer, moist air from the Pacific is moved eastward over this cold current, the air mass cools. As a parcel of air cools, it reaches a temperature at which moisture would condense—the dew point temperature. When that happens, the parcel of air has 100% relative humidity and can hold no more water (relative humidity is the amount of water in a parcel of air compared to how much water that parcel of air could have, at a given temperature). Now a cloud would form. Normally clouds form high in the atmosphere. When the cloud forms at the ground it is called fog. The fog typically lasts several hours until the sun can warm up the air near the surface, and the ambient temperature of the land exceeds its dew point temperature.

Table 4.7-8. Monthly Precipitation for Richmond, California

Parameter	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Precipitation (inches)	4.78	3.88	3.10	1.67	0.54	0.17	0.04	0.07	0.21	1.27	2.92	4.44	23.09

Source: WRCC 2011b

NOTE: Precipitation is based on the data from between 1950 and 2010.

Table 4.7-9. Monthly Precipitation for Berkeley, California

Parameter	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Precipitation (inches)	4.99	4.10	3.21	1.63	0.76	0.19	0.03	0.06	0.26	1.26	2.79	4.15	23.42

Source: WRCC 2011b

Precipitation is based on the data from between 1893 and 2010.

Table 4.7-10. Monthly Precipitation for Upper San Leandro, California

Parameter	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Precipitation (inches)	4.97	4.22	3.73	1.77	0.68	0.17	0.04	0.08	0.29	1.49	3.37	4.43	25.24

Source: WRCC 2011b

Precipitation is based on the data from between 1948 and 2010.

Relative humidity at the East Bay Hill weather stations (ONO and OSO) is highest when the wind blows from the southwest across bay and lowest when the wind blows from the northeast. It is the low relative humidity coupled with high offshore (Diablo) winds and temperatures that make for increased fire hazard conditions. Additional details on relative humidity at these stations are presented in Section 4.7.3.2.5 below.

4.7.3.2.4 Stability

Atmospheric stability is composed of atmospheric turbulence and mixing. In general, the less stable an atmosphere, the greater the turbulence. Stable atmospheres tend to have light or calm winds and are often associated with high pressure areas. Vertical air movement is critical to creating a homogeneous, or uniformly stable, air mass. The amount of vertical movement or mixing in the atmosphere is partly based on how high above the surface the air mass rises. The mixing height, measured from the ground upward, is the top height of the atmospheric layer in which convection and mechanical turbulence promote mixing. In general, the frequent occurrence of temperature inversions over the San Francisco Bay Area, as discussed in Section 4.7.3.2.2, lowers the mixing height and consequently slows down mixing, which can result in air stagnation at the surface. Higher mixing heights generally provide better air quality at the surface because of greater dispersion of pollutants.

4.7.3.2.5 Wind-Direction Averaged Weather Parameters in the East Bay Hills

Tables 4.7-11 and 4.7-12 present temperature, relative humidity, wind speed, and peak gust data from the ONO and OSO monitoring stations, respectively. The data are averaged by wind direction for each site to identify high temperature, high wind speed, and low relative humidity wind directions for these locations.

The direction-averaged temperature is highest from the southwest to west, with the maximum from both sites occurring under west-southwest winds. A secondary temperature peak can be seen in the north-northeast direction for ONO and northeast for OSO. Each of these secondary peaks is associated with the lowest, direction-averaged relative humidity at each site. In addition, the direction-averaged wind speed and peak wind gust show either maximum and secondary maximum values in the north to northeast wind direction, indicating that these north to northeastern winds are the dry Diablo winds noted in Section 4.7.3.2.1 above.

From the number of observations for each wind direction, it can be seen that the wind blows from the north to east direction approximately between 23 and 25% of the time. These periods would include diurnal nighttime offshore flow as well as the Diablo wind conditions. Another parameter reported at these stations is fuel moisture (%). Reviewing the fuel moisture column again indicates the fuel moisture is lowest when winds are from the north to northeast. These high-temperature dry Diablo winds increase the potential for hazardous wildfires in the East Bay Hills.

Table 4.7-11. Temperature, Relative Humidity, and Wind Speeds Averaged by Wind Direction for Oakland North (ONO) Meteorological Station

	Wind Direction Averaged Parameter					
Wind Direction	Temperature (°F)	Relative Humidity (%)	Wind Speed (mph)	Peak Gust (mph)	Fuel Moisture (%)	No. of Observations
N	54.85	49.19	9.44	18.06	11.50	1245
NNE	56.26	48.73	9.28	17.95	11.10	1186
NE	53.45	57.20	13.11	19.73	12.49	3265
ENE	55.00	61.63	10.03	19.34	12.85	2643
E	55.01	65.25	5.51	15.89	13.98	840
ESE	54.32	71.69	4.98	10.56	16.96	273
SE	50.91	79.74	5.64	14.53	19.16	488
SSE	50.60	82.64	6.33	16.96	19.96	695
S	53.95	83.05	8.09	15.16	17.48	3703
SSW	54.62	84.06	8.29	13.21	16.25	13716
SW	57.43	75.64	5.33	12.28	13.57	5622
WSW	57.45	70.23	3.37	11.03	12.07	2189
W	57.02	66.32	2.96	9.53	12.12	1531
WNW	55.87	63.49	3.75	10.12	12.49	1278
NW	54.61	62.64	5.84	12.57	13.04	1207
NNW	55.13	58.87	5.12	15.77	12.75	648

Source: EBRPD 2012f, DWR 2012b
Period of Record: 1/1/2007 to 12/31/2011
°F = Fahrenheit
mph = miles per hour

Table 4.7-12. Temperature, Relative Humidity, and Wind Speeds Averaged by Wind Direction for Oakland South (OSO) Meteorological Station

	Wind Direction Averaged Parameter					
Wind Direction	Temperature (°F)	Relative Humidity (%)	Wind Speed (mph)	Peak Gust (mph)	Fuel Moisture (%)	No. of Observations
N	52.83	67.74	5.49	11.22	15.01	1625
NNE	53.48	63.80	6.83	12.57	14.73	2006
NE	54.38	63.37	5.98	12.04	15.31	886
ENE	51.27	73.24	1.58	11.99	17.51	157
E	51.50	73.72	1.45	6.49	16.97	119
ESE	50.06	82.62	2.03	8.37	19.44	107
SE	49.91	85.46	3.27	9.58	19.70	271
SSE	49.56	88.54	4.56	10.27	20.58	754
S	50.62	89.39	4.66	9.93	20.14	1224
SSW	53.93	84.59	3.47	5.62	18.17	1044
SW	55.00	85.32	7.39	12.81	17.14	6540
WSW	57.39	74.24	6.69	12.19	14.47	3247
W	52.74	72.80	2.93	10.26	16.76	519
WNW	52.87	68.26	1.73	7.67	15.56	207
NW	52.18	67.37	1.99	7.62	15.85	208
NNW	52.90	64.65	3.74	9.18	15.28	623

Source: EBRPD 2012f, DWR 2012b
Period of Record: 10/6/2009 to 12/31/2011
°F = Fahrenheit
mph = miles per hour

4.7.3.3 Existing Conditions for Microclimate

A microclimate is a local atmospheric zone where the climate differs from the surrounding area and is usually influenced by hills, hollows, trees, structures, or proximity to bodies of water. The term may refer to areas as small as a few square feet (such as a garden bed) or as large as many square miles. Microclimates exist, for example, near bodies of water, in heavily urban areas, or in woodlands and forests. Large bodies of water may cool the local atmosphere and increase the relative humidity. Urban areas with much brick, concrete, and asphalt tend to absorb the sun's energy, heat up, and reradiate that heat to the ambient air, creating the heat island effect. Forests tend to absorb solar radiation, regulate heat loss through the movement of water between vegetation and air, and cool the ambient air and soil. The resulting conditions represent several types of microclimates.

Within a given woodland, the tree types, age, height and density (i.e., number of trees per acre), and topography play important roles in determining the overall effect the woodland has on its microclimate. Changes in these characteristics could potentially cause changes to the microclimate. The key climate parameters that define the microclimate for a given woodland or tree stand include (Aussenac 2000, Chen et al. 1999):

- Sunlight (also referred to as solar radiation or solar energy)
- Moisture and precipitation
- Wind speed
- Air and soil temperature

The interaction of these parameters represent or describe the exchange of mass and energy between the woodland and the regional climate as well as within the various parts of the woodland (tree stands, scrub, grassland, etc.).

4.7.3.3.1 Sunlight and Albedo

The albedo of a surface is the fraction of incoming solar energy that is reflected back to space (Seinfeld and Pandis 1998). Albedo commonly refers to the "whiteness" of a surface, with 0 meaning black and 1 meaning white. A value of 0 means the surface is a "perfect absorber" that absorbs all incoming energy. Darker areas, such as forests and bodies of water, have low albedo. A value of 1 means the surface is a "perfect reflector" that reflects all incoming energy. Desert areas, clouds, and snow have a high albedo. For example, a black asphalt parking lot has a low albedo, thus, absorbs most of the sunlight striking it, raising the surface temperature to levels very uncomfortable to walk on in bare feet. The light colored concrete sidewalk next to the parking lot has a higher albedo, reflects more of the sunlight, and does not get as hot.

The amount of energy absorbed by a surface or ground covering also impacts the air temperature directly above the surface, thus, albedo is one of the parameters necessary to determine the ambient temperature. Forests and woodlands tend to absorb sunlight more and reflect sunlight less than open space and might be expected to have higher air temperatures than open ground. However, other mitigating effects occur in woodlands, such as the distribution of solar energy from tree tops to the ground surface and water evaporation. Typical albedo values in the East Bay Hills vary between 0.05 and 0.15 for conifer forests, 0.15 and 0.20 for deciduous trees, 0.16 and 0.26 for grassland, and 0.24 and 0.30 for bare soil (Climate Data Information 2010, Markvart and Castaner 2003, Oke 1987, Ollinger et al. 2008). These values indicate that the vegetation albedo generally increases with decreasing vegetation height, that is tall trees tend to have a lower albedo (less reflective) than grasses and shrubs (Oke 1987).

Photosynthesis is the process by which plants convert sunlight into chemical energy used for plant growth and propagation. In general terms, plants use sunlight to convert carbon dioxide and water into hydrocarbons needed for growth. An important byproduct of this reaction is the generation of molecular oxygen. The more sunlight that reaches a plant typically results in more plant growth. In tall tree woodlands with well-developed canopies, the upper canopy tends to capture a substantial portion of the sunlight, limiting the amount of energy reaching the lower branches and ground vegetation. This limits the amount of photosynthesis in the lower levels as well as reduces the air and soil temperatures under the canopy relative to open ground (Aussenac 2000, Chen et al. 1995, Chen et al. 1993).

4.7.3.3.2 Moisture and Precipitation

The movement of water among the atmosphere, surface ponds and streams, soil, and plants is an important natural process for both mass and energy distribution. In general, the water balance in a local area can be described as follows: the amount of water obtained from the atmosphere through precipitation is equal to the sum of surface runoff, change in soil moisture content, and loss of water back to the atmosphere through evaporation and plant transpiration (Rasmusson 1992). The movement of water as vapor back to the atmosphere is referred to as

evapotranspiration and includes evaporation of free surface water (puddles and ponds), evaporation of soil pore water, and water transpired from vegetation (Oke 1987).

Precipitation Including Fog Drip

Monthly and annual average regional precipitation rates are discussed in Section 4.7.3.1.3 above. Those values represent direct rainfall from storms. In areas of high fog occurrence, fog droplets can be another source of precipitation.

Fog drip is a type of precipitation that forms when fog droplets condense on the needles or leaves of trees or other objects and drips to the ground. Fog drip may be an important source of ground moisture and precipitation in areas of low rainfall or in areas that are seasonally dry. Fog drip can dramatically influence local conditions. Fog drip may be present in the microclimates in the project areas and may be important to each of the corresponding ecosystems.

In a study of northern California redwood forests, 34% of annual hydrologic input was from fog drip. In areas where trees had been cut down, the average annual input from fog was only 17%, proving that the redwoods were required for the fog water input to the ecosystem (Dawson 1999). In a study conducted at the Point Reyes National Seashore, the researchers concluded that some conifers use fog-drip water year-round, some use it seasonally, and others do not appear to use it directly but may use ground water containing fog drip water (Ingraham and Matthews 1995). That study suggested that fog drip penetrates the soil to root zone depth.

Farther south, on the Cahill Ridge on the San Francisco Peninsula (between Pilarcitos Creek and Crystal Springs Reservoir) at an altitude of 1,000 feet, fog drip was measured beneath tan oak (*Lithocarpus densiflorus*), coast redwood (*Sequioa sempervirens*), and Douglas-fir (*Pseudotsuga taxifolia*) trees. In 5 weeks of measurement (July 20 to August 28, 1951), fog drip below the tanbark oak produced 59 inches of precipitation, more than the total annual precipitation on nearby grasslands and chaparral (Oberlander 1956). It should be noted that the tanbark oak was the shortest tree in that study, roughly 20 ft tall. The tree with the second highest quantity of fog drip was a 125-ft Douglas fir, which collected approximately 17 inches of precipitation in the same 5-week period. Other Douglas fir trees of the same approximate height but slightly sheltered from the wind by topography produced between 7 and 9 inches of fog drip. The largest tree, a 200-ft coast redwood located within the forest only produced 2 inches of fog drip. Therefore, it was suggested that the trees that were most exposed to wind and fog (i.e., not in a group of trees or sheltered by topography) produced the most precipitation. Ingraham and Matthews (1995) had a similar observation.

The foggiest months in the Bay Area are June through August (Goodman 1985), which correspond with the driest months for rainfall (discussed in Section 4.7.3.1.3). Therefore, it is likely that fog-drip water “produced” by trees contributes a noticeable amount to the water budget used for tree growth (Fischer et al. 2008; Williams et al. 2008; Yin and Arp 1994).

One final note on precipitation in areas covered with vegetation: rainfall can be intercepted by vegetation. Large trees with closed canopies may intercept between 30 and 45% of annual rainfall while grass cover alone may intercept between 4 and 5% (Aussenac 2000). If the intercepted water evaporates from the leaf and bark surfaces before either dripping to the ground

or being absorbed by the plant, it cannot contribute to the availability of water in the ecosystem (Oke 1987).

Evapotranspiration and the Bowen Ratio

The rate of evaporation and transpiration of water from surface soils and vegetation (the evapotranspiration rate) tends to be higher in forested and woodland areas than in open ground (Oke 1987). The trees and plants in these areas continually draw moisture for the soil for growth then transpire the moisture to the atmosphere. This depletes the stored soil water continuously, until the next precipitation event. This movement of water from ground or plant surfaces also results in the transfer of energy from the surface to the atmosphere.

The evaporation of water requires energy; therefore, evaporating water off of a surface cools that surface. The energy "stored" in the water vapor is called latent energy or latent heat, and this energy is eventually released to the atmosphere when the vapor rises and cools to a point where it condenses again, forming clouds. Energy can also be transferred from plant surfaces to the atmosphere by air flow over the leaf surfaces. In this case, it is the air that removes the energy through changes in temperature of the leaf surface and air at the leaf surface boundary. This type of energy is referred to as sensible energy or sensible heat. The measurement of relative humidity in ambient air is related to the amount of latent heat in the air, and measurement of temperature is a gauge of atmospheric sensible energy.

The Bowen ratio is a measure of the ratio of sensible heat loss to latent heat loss from a surface. A high Bowen ratio indicates dry conditions where evaporation is low and heat transfer occurs primarily through sensible heat loss, resulting in heating of the air. A low Bowen ratio indicates humid conditions where heat transfer occurs primarily through latent heat loss, resulting in increased air humidity. Thus, the Bowen ratio is about 10 for deserts, between 2 and 6 for semi-arid regions, between 0.4 and 0.8 for temperate forests and grasslands, such as found in the project areas, between 0.1 and 0.3 for tropical rain forests, and 0.1 for tropical oceans (Oke 1987).

4.7.3.3.3 Wind Speed

Wind speeds near the surface are controlled primarily by the frictional drag imposed on the atmosphere by the underlying rigid surface. The drag slows motion near the ground and generates a sharp decrease of mean horizontal wind speed as the surface is approached. In the absence of strong thermal effects, the depth of this frictional influence depends on the roughness of the surface. The larger the roughness height, the slower the wind speed at the surface. The roughness height is proportional to the height of the elements that make up the roughness (grass, shrubs, trees, buildings, terrain) as well as the density of those elements per area of land surface (Aussenac 2000; Oke 1987; Schroeder and Buck 1970). Higher elevations are often times more exposed to elevated and unobstructed wind flows and would encounter higher wind speeds than surrounding areas for this reason.

The woodlands of the East Bay Hills consist of grasslands, scrub, and woodlands with various vegetation types. Typical roughness heights for grasslands range between 0.003 and 0.1 meter while deciduous and coniferous forests range between 1 and 6 meters (Oke 1987). When analyzing the potential for fire spread in a forest or woodland area, the wind speed at the mid-

flame height is typically less than half of the wind speed measured at the typical 20-ft anemometer height (Rothermel 1983).

4.7.3.3.4 Air and Soil Temperatures

The effects of solar radiation and energy transfer through the movement of water (precipitation and evapotranspiration) and air (wind) impacts surface soil and ambient air temperatures. In forests and woodlands with developed canopies, these effects buffer the daily and seasonal temperature variations compared to open ground. Soil temperature is also affected by the type and density of a forest cover. In general, soils under forest cover are warmer in the winter and cooler in the summer than open areas. These differences can be detected to depths between 80 and 100 centimeters below the surface, with temperature differences of between 4 and 5° Celsius relative to open or clear cut areas (Aussenac 2000).

4.7.3.4 Existing Conditions for Climate Change

Climate change is typically measured by changes in parameters associated with weather and climate, seas and oceans, snow and ice, and society and ecosystems. The parameters that are most directly applicable to the proposed project areas include surface air temperature, precipitation, and sea level rise.

The average surface air temperature in the San Francisco Bay area has experienced a slight increase of approximately 1 ^{o}F between 1901 and 2008 (EPA 2010c). Future air temperatures in this area are projected to increase by as much 3 ^{o}F by 2020, 5.5 ^{o}F by 2050, and 10 ^{o}F by 2100 (Karl et al. 2009; Moser et al. 2012).

Annual precipitation in the bay area also experienced a slight increase between 1901 and 2008, up to a 10% increase over that time period. Future projections indicate that annual precipitation would probably decrease by as much as 3% by 2020, 9% by 2050, and 12% by 2100 (Cayan et al. 2012). On a seasonal basis, the largest decrease in precipitation would occur during the spring, possibly by as much as 25% by 2100 compared to average spring rainfall between 1961 and 1979 (Karl et al. 2009).

Sea level rise is generally attributed to discharges from glaciers and polar ice sheets by processes that are not well understood (Karl et al. 2009). However, sea level rise has been found to correlate reasonably well with global mean surface air temperature (Cayan et al. 2012). Measured sea level rise in San Francisco Bay area between 1958 and 2008 was as much as 2 inches (EPA 2010c). Sea level rise projections for the area range from 10 inches to 18 inches by 2050 (Moser et al. 2012; Cayan et al. 2012) and may reach 31 inches to 55 inches by 2100 (Karl et al. 2009; Moser et al. 2012; Cayan et al. 2012). Extreme sea level rise events (storm surge) may occur for up to 100 hours per year by 2050 and may exceed 3,000 hours per year by 2100 in the area (Cayan et al. 2012).

4.8 Historic Properties

This section includes a description of the area of potential effect (APE) and known historic properties in the APE based on field surveys and archival research. The section also includes a discussion of the cultural history of the area and the initial consultation and coordination with the State Historic Preservation Officer (SHPO) and any interested parties (e.g., Native American tribes).

4.8.1 Regulatory Setting

4.8.1.1 National Environmental Policy Act (42 U.S.C. §§ 4321 et seq.)

NEPA requires the consideration of potential environmental impacts, including potential impacts to cultural resources, in the evaluation of any proposed federal agency action. This includes consideration of unique characteristics of the geographic area, such as proximity to cultural resources and the degree to which the action may adversely affect historic properties listed in or eligible for listing in the National Register of Historic Places (NRHP).

4.8.1.2 National Historic Preservation Act (16 U.S.C. §§ 470 et seq.)

The National Historic Preservation Act establishes the federal government policy on historic preservation and the programs, including the NRHP, through which this policy is implemented. Under the National Historic Preservation Act, significant cultural resources, referred to as historic properties, include any prehistoric or historic district, site, building, structure, object, or landscape included in, or eligible for inclusion in, the NRHP. A property is considered historically significant if it meets one of the NRHP criteria and retains sufficient historic integrity to convey its significance.

This act also established the Advisory Council on Historic Preservation, an independent agency responsible for implementing Section 106 of National Historic Preservation Act (Section 106) by developing procedures to protect cultural resources included in, or eligible for inclusion in, the NRHP. Regulations are published in 36 CFR §§ 60 and 63, and 36 CFR § 800.

4.8.1.3 36 CFR § 800 Implementing Regulations, Section 106 National Historic Preservation Act

Section 106 requires that effects on historic properties be taken into consideration in any federal undertaking. The process contains five steps: (1) initiating the Section 106 process, (2) identifying historic properties, (3) assessing adverse effects, (4) resolving adverse effects, and (5) implementing stipulations in an agreement document.

Section 106 affords the Advisory Council on Historic Preservation and the SHPO, as well as other consulting parties, a reasonable opportunity to comment on any undertaking that would adversely affect historic properties listed in or eligible for NRHP listing. SHPOs administer the national historic preservation program at the state level, review NRHP nominations, and maintain data on historic properties that have been identified but not yet nominated in addition to consulting with federal agencies during Section 106 review. In addition, pursuant to Section 106, the 2005 First Amended Agreement among FEMA, the SHPO, California Emergency

Management Agency (Cal EMA), and the Advisory Council on Historic Preservation stipulates specific consultation steps between the participating agencies.

4.8.1.3.1 Significance Criteria

The NRHP uses the eligibility criteria set forth in 36 CFR § 60.4 to evaluate significance of potential historic properties. The criteria for evaluation are as follows:

(a) [properties] that are associated with events that have made a significant contribution to the broad patterns of our history

(b) [properties] that are associated with the lives of persons significant to our past

(c) [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

(d) [properties] that have yielded, or may be likely to yield, information important in prehistory or history

4.8.1.3.2 Traditional Cultural Properties

Section 101(d)(6)(A) of the National Historic Preservation Act allows properties of traditional religious and cultural importance to a Native American tribe to be determined eligible for inclusion in the NRHP. In addition, a broader range of Traditional Cultural Properties may also be listed in or determined eligible for listing in the NRHP. Traditional Cultural Properties may be eligible for listing in the NHRP because of their association with cultural practices or beliefs of living communities that (a) are rooted in that community's history and (b) are important in maintaining the continuing cultural identity of the community. In the NRHP programs, "culture" is understood to mean the traditions, beliefs, practices, lifeways, arts, crafts, and social institutions of any community, be it an Indian tribe, a local ethnic group, or the people of the Nation as a whole.

4.8.1.4 First Amended Programmatic Agreement

Per the 2005 Programmatic Agreement between FEMA, the California SHPO, California Governor's Office of Emergency Services, and the Advisory Council on Historic Preservation, the following stipulations shall be adhered to:

VII. STANDARD PROJECT REVIEW

Except as described in Stipulation VI., FEMA will conduct the standard project review for all non-emergency undertakings:

A. Area of potential effects (APE): For standing structures, the APE will be the individual facility [as defined in 44 CFR § 206.201(c)] when a proposed undertaking is limited to the repair or rehabilitation of the facility's interior and/or exterior. FEMA will determine the APE, and may consult with the SHPO, for all other undertakings, including APEs for ground-disturbing activities.

B. If FEMA determines that there is a reasonable potential for archeological properties to be within the APE, FEMA will also determine the level of effort necessary to identify and define the limits of these properties.

C. FEMA will identify and evaluate properties to determine if they are listed in or eligible for the National Register. If FEMA does not identify any historic properties, or determines that an undertaking avoids archeological historic properties (both directly and indirectly) or character-defining features of historic standing structures, FEMA will make a documented determination of "no historic properties affected" as described in 36 CFR § 800.4(dX I). Unless the SHPO or any other consulting party objects within 21 days of receipt of this documented determination, FEMA will complete the review and may fund the undertaking. If the SHPO or any other consulting party objects to the determination, FEMA may request Advisory Council on Historic Preservation (ACHP) review, as described in 36 CFR § 800.4(dXIXii), or will proceed as follows.

D. If FEMA determines that an undertaking may affect historic properties, FEMA will apply the criteria of adverse effect, described in 36 CFR § 800.5(a)(l), or determine whether the undertaking meets the standards, or any other applicable secretary standards or guidelines.

Additionally:

X. UNEXPECTED DISCOVERIES

A. FEMA will be notified as soon as practicable if it appears that an undertaking will affect a previously unidentified property that may be historic or affect a known historic property in an unanticipated manner. The applicant will stop construction activities in the vicinity of the discovery and take all reasonable measures to avoid or minimize harm to the property until FEMA concludes consultation with the SHPO. In the case of human remains, the applicant is required to immediately notify the local law enforcement office and the county coroner/medical examiner. Pursuant to the California Health and Safety Code (Code), if the coroner/medical examiner determines that the human remains are or may be of Native American origin, the discovery will be treated in accordance with §§ 5097.98 (a-d) of the Code.

B. FEMA will consult with the SHPO as soon as practicable to develop actions to take into account the effects of the undertaking. FEMA will notify the SHPO of any time constraints, and these parties will mutually agree upon time frames for this consultation. Office of Emergency Services and the applicant may also participate in this consultation. FEMA will then provide the SHPO with written recommendations that take into account the effects of the undertaking. If the SHPO does not object to FEMA's recommendations within an agreed upon time frame, FEMA will require the applicant to modify the scope of work accordingly.

4.8.2 Cultural Setting of the Proposed Project Area

4.8.2.1 Prehistory

The Paleo-Archaic-Emergent cultural sequence developed by Fredrickson (1974) is commonly used to interpret the prehistoric occupation of Central California. Recent research by Groza (2002), LaJeunesse and Pryor (1996), and Meyer and Rosenthal (1997) using new radiocarbon dates have updated Fredrickson's interpretation to delineate the cultural sequence into the following periods: the Paleo-Indian period (11550 to 8550 B.C.); the three-staged Archaic period, consisting of the Lower Archaic (8550 to 5550 B.C.), Middle Archaic (5550 to 550 B.C.), and Upper Archaic (550 B.C. to 1100 A.D.); and the Emergent period (A.D. 1100 to 1769).

The Paleo-Indian period began with the first entry of people into California, with the Central Valley area settled by native Californians as early as 13,500 years ago (Rosenthal et al. 2007). Human populations during the Paleo-Indian period were low and probably consisted of small groups moving frequently in order to exploit plant and animal resources. Current research, however, is indicating more sedentism, plant processing, and trading than previously believed. The Archaic period is characterized by increased use of plant foods, elaboration of grave goods, and increasingly complex trade networks (Bennyhoff and Fredrickson 1994; Moratto 1984). The Emergent period is marked by the introduction of the bow and arrow, the ascendance of wealth-linked social status, and the elaboration and expansion of trade networks, signified in part by the appearance of clam disk bead money (Moratto 1984).

Penutian populations migrated into central California around 4,500 years ago and were firmly settled in the San Francisco Bay by 500 A.D. (Moratto 1984). During the Emergent period, ancestors of the Ohlone entered the San Francisco Bay area and occupied the region from the Carquinez Strait south to Point Sur (Kroeber 1925 and Levy 1978). Ohlone living in the East Bay at the time of contact spoke the Chochenyno dialect, and tribelets occupying the area at the base of the East Bay Hills (EBH) included the *Huichun*, *Lisyan*, Palos Colorados, and San Antonio. This area was dominated by freshwater marshes and wetlands at the bay margin, oak groves and grasslands at the base of the hills, and redwood groves in the hills.

4.8.2.2 Ethnography

The East Bay Hills were formerly occupied by the Costanoan—also commonly referred to as Ohlone—language groups. Ohlone territory bordered that of the Bay Miwok in the northeastern portion of the East Bay Hills. Thus, it is likely that the Bay Miwok used and occupied portions of the project area (Levy 1978).

Ethnologically, the Ohlone and Bay Miwok are very similar (Milliken 1995); the discussion below applies to both groups.

The basic Ohlone and Bay Miwok social area was the family household, which was extended patrilineally (Harrington 1933). A household was made up of about 15 individuals (Broadbent 1972). Households grouped together to form villages, which in turn combined to form tribelets, "… an aggregate of villages in the largest of which lived the tribelet chief" (Heizer and Elsasser 1980).

Four Ohlone tribelets occupied the East Bay Hills and its environs. *Huichun* territory encompassed areas now in the cities of Richmond and El Cerrito, south to the northern end of Tilden Regional Park. A tribelet referred to as the Palos Colorados in mission records occupied the areas now included in Redwood and Lake Chabot Regional Parks. San Antonio tribelet territory encompassed what is now central Oakland and likely extended into Sibley Volcanic Regional Preserve and Redwood Regional Park. The *Lisyan* tribelet occupied what is now San Leandro as well as portions of Lake Chabot Regional Park. *Saclan* Bay Miwok tribelet territory may have encompassed northeastern portions of Wildcat Canyon Regional Park, Alvarado Park, Kennedy Grove Regional Recreation Area, and Sobrante Ridge Regional Preserve. The *Yrgin* Bay Miwok tribelet occupied what are now the cities of Hayward and Castro Valley and the southern portion of Lake Chabot Regional Park.

Approximately 40 Ohlone tribelets exchanged trade goods, such as obsidian, shell beads, and baskets; participated in ceremonial and religious activities together; intermarried; and could have extensive reciprocal obligations to one another involving resource collection. “The Ohlones,” writes Malcolm Margolin, “were not forty independent, isolated tribelets jealously guarding their frontiers. Rather, each tribelet was involved in a network of feasting, trading, and gift- giving” (1978). Additionally, Bay Miwok and Ohlone tribelets engaged in intertribal trade with each other as well as with surrounding groups, including the Yokuts, Coast and Plains Miwok, Patwin, and Nisenan (Levy 1978).

For the Ohlone, like many other native Californians, the acorn was a dietary staple. Acorns were knocked from trees with poles, leached to remove bitter tannins, and eaten as mush or bread. Archaeologist Peter Schulz states, “It is largely to [acorn] exploitation that the high population densities and complex social and economic organizations of [central California] are attributed” (Schulz 1981). The Ohlone used a range of other plant resources as food, medicine, soap, tools, building materials, and medicine, including buckeye, California laurel, elderberries, strawberries, manzanita berries, goose berries, toyon berries, wild grapes, wild onion, cattail, soap root, wild carrots, clover, and an herb called chuchupate. Animals eaten by the Ohlone and their neighbors included large fauna, such as black-tailed deer, Roosevelt elk, antelope, and marine mammals; smaller mammals, such as dog, skunk, raccoon, rabbit, and squirrel; birds, including geese and ducks; and fish, such as salmon, sturgeon, and mollusks. Frogs, toads, owls, eagles, and ravens were not eaten (Levy 1978 and Lightfoot and Parrish 2009).

Besides providing sustenance, the Bay Area’s flora and fauna provided the Ohlone with raw materials. For example, the Ohlone built dome-shaped shelters which they thatched with ferns, tule, grass, and reeds. The thatch was tied to the structure’s frame with willow withes. The Ohlone also built small sweathouses, accommodating six to eight persons, which were dug into creek banks and roofed with brush, and circular dance areas, which were enclosed by fences woven from brush or laurel branches (Levy 1978). Plants, particularly sedge, were also woven into baskets. Basket making was generally done by women, who crafted cooking and storage containers, fish traps, and trays for leaching acorns. Tightly woven baskets, decorated with feathers or shell, were valued exchange items (Margolin 1978).

Animal bones, teeth, beaks, and claws were made into awls, pins, knives, and scrapers. Pelts and feathers became clothing and bedding while sinews were used for cordage and bow strings. Feathers, bone, and shells were crafted into ornaments (Heizer and Elsasser 1980).

By the late 18th century, Spanish settlers moved into northern California, established the mission system, and dramatically transformed Ohlone culture. Mission records indicate that the first Huchiun was baptized in 1787 with the first large group from that tribelet arriving at Mission San Francisco in the fall of 1794 (Milliken 1995). Following the secularization of the missions in 1834, many of the surviving Ohlone worked as manual laborers on ranchos (Levy 1978).

Ohlone and Bay Miwok people currently live in their traditional territory, which includes Alameda and Contra Costa County, and, despite more than a century of negative impacts, continue to engage in traditional cultural practice. Tribal organizations in the area like the Amah/ Mutsun Tribal Band and the Indian Canyon Mutsun Band of Costanoan provide members and the surrounding communities with economic, entertainment, and educational opportunities.

Native American land use would have included habitat management for the purpose of securing and maintaining resources. Although there is no evidence that prehistoric groups in the region were practicing agriculture, data do exist that native people manipulated their environment to encourage growth and increase of natural resources, such as flora and fauna. In recent studies, data have provided evidence that prehistoric peoples used intentional burning, also known as “slash-and-burn”, to manage ecosystems (Williams 2001). The Costanoans and Bay Miwok, like many California groups, practiced intentional burning to clear their villages of underbrush, other plants, and trees. Additionally, after the season for harvesting seeds and nuts, the grasses would often be set on fire to promote growth for the next harvesting season (Margolin 1978). Recent vegetation studies within the APE have resulted in speculation regarding prehistoric plant management; it is likely that intentional burning has resulted in the vegetation distribution observed today (EBRPD 2009b).

4.8.2.3 Historical Period

The historical period of the East Bay Hills is discussed thematically in the following sections.

4.8.2.3.1 Rancho Period

In 1820, the Spanish crown granted the lands between “El Cerrito” (probably Albany Hill) and San Leandro Creek to Luis Maria Peralta, a former soldier who had lived in the Pueblo of San Jose for many years. The Peralta grant was one of the largest in California at approximately 44,800 acres. The land was used mainly for ranching cattle and sheep, with some land cultivated for crops, in particular olives. The area now known as the East Bay Hills was used for grazing. In the redwood forests, there were minor lumbering efforts, mostly to fulfill the limited demands of the rancho and the local missions.

Peralta and his wife, Maria Loreto Alviso, had 17 children, of whom nine lived until adulthood. In 1842, when Peralta was 83, he divided his ranch between his four sons, Ignacio, Antonio, Vicente, and Domingo. However, the sons’ tenure on the land was cut short only a few years later by the huge influx of Americans during the gold rush, many of whom simply seized land legally owned by the Peraltas and other Mexican families (Bagwell 1982).

4.8.2.3.2 Logging, Mining, and Homesteading

California first engaged in commerce with the United States in the 1830s, prior to statehood, due to the hide and tallow trade that provided large quantities of hides to the eastern United States. American settlers began to arrive in California in the early 1840s and amassed enough political power by 1846 to wrest control of the region from Mexico.

The Gold Rush of 1848 to 1851 brought vast numbers of fortune seekers from all over the world. However, most failed to get rich at gold mining and left the gold fields of the Sierras and returned to the San Francisco area. One commodity that was especially valuable was lumber, which increased in value 1,000 to 2,000% between 1847 and 1849 as a result of the building boom in San Francisco. The East Bay Hills held the most easily accessible lumber in the Bay Area. The 5-square-mile redwood forest that extended along the east side of the hills between what is now Tilden Regional Park in the north and Lake Chabot Regional Park in the south soon became the center of the Bay Area lumber industry. While the East Bay was very lightly settled between 1849 and 1852, the redwoods were the scene of a bustling lumber industry, employing 400 men and four sawmills, mostly in the area encompassed today by Redwood Regional Park. Because of the extremely high demand, the East Bay redwoods were almost entirely logged over by 1860; not a single old-growth tree remains today (Bagwell 1982, Banks 1982).

The interior valleys of the East Bay Hills also came to the attention of ranchers and homesteaders in this early period. While records of land use in the post-Peralta period are scarce, it is clear that by 1878 the whole of the hills had been subdivided among various landowners. A few structures are shown on Thompson and West's 1878 map of the area. These included the single structure, likely a home, on E. D. Brown's 1,200-acre holding at the southern end of Lake Chabot Regional Park. Brown was the clerk of the Redwood School District in 1876 (Merritt 1928).The Grass Valley Ranch, 4,200 acres owned by Robinson and Waters, was in what is currently the northern end of Lake Chabot Regional Park. The ranch included at least two buildings with an access road traversing the property. Between the Grass Valley Ranch and Brown's holding lived David Badger who farmed 20 acres. The area of the current Sibley Volcanic Regional Preserve and Redwood Regional Park, however, appears mostly undeveloped. In general, ranching and to a much lesser extent farming were important land uses in the East Bay Hills from a very early period (Thompson and West 1878; Merritt 1928).

At the end of the 19th century, the Leona Heights area of Oakland began to be exploited by paint and gravel companies. Rock was quarried, first for paint manufacturing in the 1880s, then for macadam and concrete after 1890, and finally for iron pyrite ore between 1906 and 1926. A railroad was built in 1888 to carry ore from the quarry down to the railroad main line. The railroad also served as a nexus for other developments in the area; a hotel and other buildings had been constructed near the railroad terminus by 1900. Although the Leona Heights quarry is still in operation, it appears that historical mining activities took place outside the current project area.

These early ranching, farming, mining, and lumbering activities generally took place without the consent of the Peraltas, the legal landowners. The widespread practice of squatting and the lengthy and expensive process of defending their land title in the courts whittled the family's landholdings to a small fraction of their original extent.

Development of the East Bay Hills did not occur rapidly as much of the land was utilized for resource procurement, whether as quarries, lumber, or ranching. As the natural vegetation was depleted, in the 1880s, more than one land owner began to plant Australian eucalyptus trees in earnest, specifically developer Frank Havens. The Judson Dynamite and Powder Company planted groves of eucalyptus to camouflage the land scars left by the explosions and for noise abatement (Santos 1997). In a mistaken understanding of the usefulness of the tree, in the early 1900s, dozens of groves of eucalyptus trees were planted in the Oakland and Berkeley Hills to replenish the lumber industry, only to find out too late that these trees were less than desirable as a lumber resource (Santos 1997). Since European occupation, many devastating fires have been documented in the region. Ironically, as the region's population grew, eucalyptus trees were also planted as wind breaks and as a means of fire control, the land owners not fully understanding the nature of the tree as a notoriously flammable agent (Santos 1997). Although the eucalyptus was the more aggressively introduced non-native tree to the area, the Monterrey Pine comes in at second. During the late 1800s to early 1990s, the Monterrey Pine was also planted in the East Bay Hills for use as lumber, and it too would later be recognized for its flammable nature. Since 1900, nearly a dozen catastrophic fires have been documented in the region.

4.8.2.3.3 City of Oakland

The City of Oakland, consisting of 75 inhabitants, was founded on May 4, 1852, on what had previously been part of the Peralta Spanish land grant. Located on the coastline of the East Bay, Oakland functioned as a shipping port and was subject to consistent visitation, both as a shipping wharf and as a tourist destination. By 1853, the growing city had established the College School, which in time would become the College of California and later the University of California. By 1860, Oakland's population had reached 1,543 (City of Oakland Nd.). City expansion continued steadily, and in 1872 the Town of Brooklyn was incorporated into Oakland. The 1906 earthquake and fire devastated the City of San Francisco and significantly impacted the growth rate of Oakland and neighboring communities. Relocation of San Francisco's citizenry greatly increased the populace in the East Bay; by 1910, Oakland's population was greater than 150,000 (City of Oakland Nd.).

Although the Transcontinental Railroad established a station in Oakland under the Central Pacific Railroad in 1869, the East Bay communities lacked proper transportation corridors, and as population numbers increased, transportation improvements throughout the East Bay were heavily needed. Many communities were difficult to access, and the EBH were difficult to traverse due to their rugged terrain and lack of safe roads. In the 1880s, there was one access route through the Oakland and Berkeley Hills from Lafayette; this route was long and dangerous due to its steep and twisting path, and it was not uncommon for fatal accidents to routinely occur (Caldecott Tunnel 2012). Attempts were made as early as the 1860s to tunnel through the hills, but funding was unavailable until the 1890s. In 1903, the Broadway Tunnel (also known as the Kennedy Tunnel) opened. Although a great improvement for transportation, traversing the Broadway Tunnel did not come without its risks. The tunnel was unlit, over 1,000 feet long and only 17 feet wide. Because of its narrowness, the tunnel could not support two-way traffic; signals using fire-lit newspapers would be sent out by drivers prior to entering the tunnel to warn drivers who might be entering at the opposite end, to yield (Caldecott Tunnel 2012). Although the tunnel was widened in 1915, passage for transport trucks and other large vehicles still

possessed issues. In 1934, construction for an improved tunnel began, and in 1937, the Broadway Low Level Tunnel (later to be renamed the Caldecott Tunnel), connecting Oakland with Contra Costa County, was opened. The Broadway Low Level Tunnel was built 220 feet below the Old Broadway Tunnel alignment. Other transportation improvements included the Bay Bridge, connecting Oakland to San Francisco, which was opened in 1936.

Aside from residential and commercial growth, Oakland and other cities in the East Bay viewed recreation and open spaces as an important element in a city's urban development. In 1909, Oakland's Playground Commission held its first meeting, resulting in programs being established at two schools and the incorporation of the Playground Division (City of Oakland 2013). In 1945, Oakland voted for city improvement bonds worth $15 million; the planning for swimming pools, playgrounds, libraries, and other city programs were developed with the passing of the bonds (City of Oakland Nd.). The Sequoia Horse Arena opened in 1948, and a year later, the North Oakland Recreation Center was opened. By 1951, there were over 110 recreation areas and open spaces in Oakland alone. In 1963, Lake Merit Wild Duck Refuge was listed on the NRHP (Oakland). In the late 1980s, various new programs and organizations were established to direct and continue the growth of recreation, parks, youth sports, and open space administration. Caldecott Park opened in 1986. Preservation Park, a residential park model replicating a Victorian era neighborhood, opened in 1991. The following are examples of significant open space and recreation facilities managed by Oakland: North Oakland Regional Sports Field (locally called the Caldecott Field), Grizzly Peak Open Space, Diamond Recreation Center, Joaquin Miller Park, Peralta Hacienda Park, Rancho Peralta Park, and Coliseum Gardens Park.

Since historic occupation, there have been many natural disasters that have been documented in the Bay Area, and Oakland has been subject to its share. In 1989, an earthquake destroyed over 1,000 residential structures, and 45 lives were lost; City Hall obtained damage as well (City of Oakland Nd.). In 1991, wildfires destroyed more than 3,500 residences, and 25 lives were lost. After being retrofitted for earthquakes, at a cost of $80 million, City Hall reopened in 1995.

Oakland's urban development to date has included many significant expansions and constructions, such as a Bay Area Rapid Transport station, the Oakland Museum of California, Oakland/Alameda County Coliseum Arena, the State Historical Landmark Peralta Hacienda, and Henry J. Kaiser Convention Center (formerly the Oakland Civic Auditorium). Census records state that as of 2010, there are an estimated 390,724 city residents in Oakland.

4.8.2.3.4 Equestrian Centers

The Oakland area has a storied equestrian history dating back to the end of the 19th century. Prior to the urbanization of the East Bay, ranchers planted crops, orchards, and drove cattle into the Oakland Hills. Several families established riding stables and trails throughout the area known today as Chabot Regional Park and Redwood Regional Park. Multiple equestrian facilities were located throughout the area around Skyline Boulevard, including Piedmont Trails Club (later Piedmont Stables), Skyline Ranch, Anthony Chabot Equestrian Center, Oakland Riding Academy, Lake Aliso Stables, and Ranch San Antonio. The stables of the Oakland Hills have housed high profile residents, including Charlie O, a mule that was the Oakland A's mascot during the 1960s and 1970s, and two Arabian horses belonging to Jordan's King Hussein (Christopher 2006).

The first stable in the area was established in 1912 by Beatrice Graham at the intersection of 24th Street and Telegraph Avenue. She later added to her stables by expanding adjacent to the Claremont Hotel. By the 1920s, Graham had relocated to Redwood Canyon and opened Redwood Riding Academy at the corner of Skyline Boulevard and Stantonville Avenue where she remained until 1951 (Marshall and Tobey 2008).

Another early stable in Redwood Canyon was Piedmont Trails Club, established in 1929 by the Cavalier-Durney family. Piedmont Trails Club was the destination for pleasure riders in the area and local equestrians, such as Daisy Howard (Marshall and Tobey 2008). In the early 1940s, management of Piedmont Trails Club was under Bill Patten and Jimmy Black. During this period, the management team opened the stables to public boarding. In 1949, Black became manager of Skyline Ranch, and Patten continued to manage Piedmont Stables. Lloyd Graham, considered one of Oakland's most famous horsemen, took over the management of Piedmont Stables in 1956 and managed it for 40 years until his retirement in 1996.

In 1949, Stanley Cosca partnered with Jimmy Black, former manager of Piedmont Riding Club, and constructed Skyline Ranch. During Black's management, he and his family taught a diverse group of equestrians, ranging from Hollywood stars to local children, to ride at Skyline Ranch. Loretta Cosca, daughter of Stanley and Florence Cosca, became a professional of the Rodeo Cowboys Association and a well known trick-riding and trick-roping equestrian, performing throughout northern California (Marshall and Tobey 2008). Stanley and Florence Cosca owned Skyline Ranch into the 1990s.

Anthony Chabot Equestrian Facility is located in Anthony Chabot Regional Park. In 1954, after losing their property at Wildwood Road, George and Yvonne White approached William Penn Lott, the director of EBRPD, about collaboration for the construction of an equestrian facility. An agreement was struck; EBRPD would own the facility, and the Whites would manage it. EBRPD hired architect Urban Lachman to design the tortoise-shaped facility. The Whites operated the Anthony Chabot Equestrian Facility together for more than three decades, until George's death; Yvonne continued running the stables into the 1990s (Marshall and Tobey 2012).

The arrival of Cornelia Van Ness Cress in 1928 marked an important moment in the Oakland Equestrian community. Cress, an experienced horsewoman, had ridden with the U.S. Cavalry and worked at a cattle ranch in Montana prior to relocating to Oakland. Anticipating that future urban development in Oakland would force out the equestrian community, Cress organized a lobby that installed a city plan to maintain horse trails in the southern East Bay Hills; additionally, Cress founded the Metropolitan Horsemen's Association (MHA) in 1938 (Marshall and Tobey 2008). Cress became manager of the Lake Aliso Stables at Mills College, and worked throughout the 1940s to build a world-class equestrian program.

Acreage north of Skyline Boulevard and west of Redwood Road, was donated to the MHA in 1949. This land was used to construct equestrian facilities and trail systems. The MHA built the Sequoia Arena in Joaquin Miller Park in 1949. The arena, open to the public, has hosted many equestrian classes, shows and events, including the horse and dog meet-and-greet. This has been a popular event where both animal species that use the trails get to interact with each other in a controlled setting (MHA 2012). In the 1960s, land adjacent to Skyline Ranch, Oakland Riding

Academy, and Redwood Riding Stables was developed as the Huntfields Equestrian Area, which consisted of a network of multiuse trails and other equestrian facilities.

Residential communities in the Oakland Hills were specifically designed for the equestrian: the Chabot Park Highlands and Hillcrest Estates, were parceled into 1acre lots, zoned for up to three horses, and designed with circular drives to accommodate horse trailers (Marshall and Tobey 2008). Additionally, the developers Gus Himmelman, Ted Dryer (of Dreyer's ice cream), and George Hooper (of Hooper's Chocolates), designed Skyline Boulevard, a major thoroughfare in the Oakland Hills, with a horse trail incorporated into it.

The 1950s marked a turning point in the Oakland hills equestrian community. The construction of several major highways spurred the demolition of multiple stables. In 1954, Highway 580 was built through Cressmount Stables at Mills College and Leona Stables. Hakes stables was torn down during the construction of Highway 13. Several families sold their ranches for urban development, including Gus Himmelman's home at 3731 Redwood Road to the city for the construction of Redwood Heights Recreation Center. In 1959, Pinto Ranch was sold and developed into Pinto Playground.

Since the 1980s, several of the remaining stables have been sold and demolished, including White Barn (currently the Head-Royce School) and the Green Barn at Westminster Square (currently a housing subdivision). Efforts were made to demolish Skyline Ranch in 1991, but the move was defeated by Oakland voters. Today, EBRPD operates Skyline Ranch, Piedmont Stables, and the Anthony Chabot Equestrian Center. Oakland acquired the Aahmes Shrine Stables, Rancho San Antonio, and Vista Madrea in 1994 and renamed it City Stables. Of the dozens of equestrian facilities in operation during the mid to late 1900s, today there are only four public equestrian centers and one private center remaining in Oakland (Christopher 2006; Marshall and Tobey 2008). Serpentine Prairie, located north of the The Hunt Field/Redwood Arena, was designated as a botanical preserve by Oakland and is no longer open to riders (Marshall and Tobey 2008, Marshall 2012).

4.8.2.3.5 UCB

The College of California, consisting of 160-acres located northwest of Oakland, was established by the Trustees of the College of California in 1860. The College, in 1868, merged with the Agricultural, Mining and Mechanical Arts College to form the University of California; it officially opened as such in 1873 (Kielusiak 2000).

When UCB first was established, there were approximately a dozen residences within a half mile radius of the school. By 1879, over 200 surrounded the campus (Kielusiak 2000). The City of Berkeley was founded in 1878.

UCB required a dependable supply of water for its use by various facilities and its growing population. Prior to East Bay Municipal Utility District (EBMUD) water supply systems, Strawberry Canyon served as UCB 's main water source (Kielusiak 2000). UCB's locale, formerly the College of California, had been chosen because of its proximity to Strawberry Creek (Kielusiak 2000; FEMA 2006c). Accordingly, it was viewed by the University trustees as a very important resource to control and maintain. UCB purchased a portion of Strawberry

Canyon in 1909. UCB first used the canyon open land for cattle grazing and keeping dairy cows, but recognizing its potential for ecological and habitat study, UCB developed a forestation program. Starting in 1913, the university began planting pine, cypress, eucalyptus, and redwood trees (FEMA 2006c). In 1923, UCB built Memorial Stadium within Strawberry Canyon. To date, UCB has continued to maintain much of Strawberry Canyon for recreation and continued habitat studies and open space preserves. UCB's Frowning Ridge property is largely within Strawberry Canyon.

Also under UCB management are portions of Claremont Canyon. According to the EBRPD (2009b), the canyon lands were originally part of Peralta's land grant, which later was known as Telegraph Canyon for the transcontinental telegraph line that traversed the area in the late 1800s. In the time between telegraph operations and land acquisition by UCB, the canyon lands have transferred to various owners. In the 1800s, the Marron family dairy farm and Alameda Water Company were established in the canyon. In 1910, Frank Haven acquired land and built the Claremont Hotel and promptly planted eucalyptus trees around the property. During this time, other landowners were also planting eucalyptus trees in the canyon, believing the trees would be suitable for lumber. By 1929, the undeveloped canyon lands were open and used for horse and hiking trails. In 1961, UCB acquired approximately 150 acres of undeveloped land from the water company with no intent to build on it but to keep it as open space. In 1978, the lands for the Claremont Canyon Regional Preserve were acquired by EBRPD. The preserve is adjacent to UCB managed lands and campus facilities.

Thanks in part to funding by philanthropists, such as Phoebe Apperson Hearst and Levi Strauss in the 1890s, the university began development of numerous programs and constructed iconic campus buildings. UCB has experienced many accomplishments during its tenure. Important discoveries, such as vitamin E and the flu virus, were made at the university and nearly two dozen professors have received the Nobel Prize.

4.8.2.4 Water and Parks

The amount of land in the East Bay Hills available for private use steadily diminished as land was purchased by water districts for water storage and watershed preservation. The East Bay Water Company, which was formed from the various local water companies in the early 1920s, in particular acquired significant tracts of land in the East Bay Hills. The precipitous valleys of the East Bay Hills first attracted the attention of Anthony Chabot, a civil engineer who designed a number of reservoirs for the Contra Costa Water Company. Oakland's rapid growth in the 1860s and 1870s outpaced the supply of naturally available water. Chabot's design and construction of Lake Temescal in 1868 and Lake Chabot in 1874 and 1875 provided a large reserve of water that the city could rely on in the dry months (Bagwell 1982, Banks 1982).

The San Leandro and San Pablo Reservoirs were constructed in the early 20th century. However, because of periodic droughts and urban growth, demand quickly overwhelmed the existing system. In 1924, EBMUD was formed to import water from the Mokelumne River in the Sierra Nevada to provide a reliable source of the water. EBMUD acquired the East Bay Water District and its landholdings throughout the East Bay in 1928. With the Mokelumne River pipeline in place, much of this land was no longer needed for water storage. In 1928, more than 10,000 acres in the East Bay Hills were declared to be "surplus and available" (Stein 1984). This declaration

galvanized community support for the formation of regional parks in the Oakland-Berkeley Hills. The East Bay Metropolitan Park Association, joined by the Sierra Club and a fleet of other civic organizations, mounted a fierce electoral campaign in 1934 for the creation of EBRPD; the ballot measure won by a large margin.

4.8.2.5 Urban Development, Suburban Development, and the Growth of EBRPD

The story of the East Bay Hills in the middle 20th century details the growth of parks but also of urban encroachment. At the turn of the century, urban development in the East Bay was confined to the alluvial plain. MacArthur Boulevard was a country road, with a sparse scatter of buildings. The Upper Temescal Creek area was also sparsely developed, with only a dirt road and a few structures. The only significant development in the hills was "Laundry Farm," a farm near the current site of the Leona Heights quarry, which could be reached by railroad line (U.S. Geological Survey [USGS] 1897). By 1923, MacArthur Boulevard was more fully developed, and the Lafayette Railway had been built to bring commuters from Lafayette up San Leandro Creek and through a rail tunnel to Oakland. Sequoyah Country Club, north of the current Knowland Park, had also been built. Nonetheless, at this time MacArthur Boulevard marked the eastern limit of urban encroachment into the hills. Montclair was no more than a few scattered houses, Trestle Glen (then known as "Indian Gulch") was in its natural state, and the upper San Leandro Reservoir had not yet been created. The Berkeley Hills were also largely undeveloped (USGS 1915).

Development of the East Bay Hills began to intensify in the late 1930s and accelerated after 1960. USGS quadrangle maps from the 1940s and 1950s show development from the estuary to Mountain Boulevard (the current route of the Highway 13 freeway). Skyline Boulevard was constructed by this time, but no development is evident. The street grid in Montclair was laid out, and the neighborhood was developing. The Trestle Glen neighborhood was subdivided by the early 1940s (USGS 1941). Gradual development continued until 1959 when Skyline Boulevard was more, but still sparsely, developed and Montclair mostly developed (USGS 1959a). Residential development throughout the East Bay Hills accelerated in the 1960s and early 1970s. By the early 1970s, the Highway 13 freeway was connected to Highway 580, and the area to the east of Highway 13 below Leona Heights was completely developed. Farther north, the Hiller Highlands, Claremont Canyon, and the upper reaches of Shepard Creek had all been fully developed. By 1973, the East Bay Hills neighborhoods looked much like it does today (USGS 1959b).

The residential development in the East Bay Hills was paralleled by major growth in the EBRPD's holdings. Early growth of the park district was slow. By 1940, EBRPD owned and managed the areas that are now Sibley Volcanic Regional Preserve and Lake Temescal, Tilden, and Redwood Regional Parks. Roberts Regional Recreation Area and Anthony Chabot Regional Park were acquired in 1952, and there were no further acquisitions until 1963. The next few years saw rapid land acquisitions; Briones and Wildcat Canyon Regional Parks, Kennedy Grove, and Las Trampas Regional Wilderness were all added to the EBRPD system by 1967. By 1971, EBRPD purchased Claremont Canyon along with substantial amounts of land along the Bay shoreline and further east. The Leona Canyon Regional Open Space Preserve is a recent addition, acquired in 1986 (Stein 1984, EBRPD 1999).

4.8.2.6 Development in the Parks and Recreation

Tilden Regional Park is the most developed of the East Bay Regional Parks and offers a number of attractions, several of which are in the project area.

Development of visitor attractions in Tilden Regional Park began as soon as the land was acquired by EBRPD. The Tilden Golf Course and clubhouse were designed by noted golf course architect Billie Bell in 1936 and opened in 1937. It was built by Works Progress Administration workers with a mix of federal and local funds. In 1937, the course hosted the first annual regional golf championship. Federal funds also covered half the cost of constructing the dam that created Lake Anza. The lake was the first in the East Bay Hills designed solely for recreation. It was begun in 1938 and opened to the public in May 1940 (Oakland Tribune 1940; Stein 1984).

The first archery range at Tilden Regional Park also opened in the late 1930s. According to EBRPD's Jerry Kent, the first location of the range was near the current location of the Little Farm and the Environmental Education Center but was moved in the early 1960s to a location on the southern flank of the golf course (Kent 2000). The latter location is in the project area, and the non-historic concrete foundation from this facility was noted on survey. The range was later moved to Briones Regional Park (Kent 2000).

Other attractions in Tilden Regional Park include the merry-go-round and the steam trains. The Tilden Merry-Go-Round, a 1911 model built by the Hershel Spillman Company, was acquired from a Los Angeles dealer in 1946 and opened to the public in May 1948 (Stein 1984). The merry-go-round is outside the current project area. The first of the steam trains, the Golden Gate Steamers, was opened in the mid-1950s in Redwood Regional Park. The Redwood Valley Railroad, in Tilden Regional Park, was opened in 1952. The ride initially had 12-inch track and was 0.75 mile long. It was remodeled to a 15-inch track by 1967 and expanded into an area vacated by the army. The ride now features a bridge, a tunnel, and a total length of about 2 miles. The trains, of various scales, feature accurate reproductions of steam locomotives and cars from 1875 to 1900. The Golden Gate Steamers, a private train club, moved to Tilden Regional Park in the 1960s and operates another set of tracks nearby.

4.8.3 Area of Potential Effect

4.8.3.1 Archaeology

FEMA has determined that the APE for direct effects to historic properties is congruent with the footprint of the proposed and connected actions, which includes all areas of vegetation treatment as well as all areas of temporary disturbance, such as staging areas and access routes. The APE encompasses approximately 2,059 acres, running primarily in a linear fashion from north to south in the East Bay Hills at the wildland-urban interface. Implementation of the proposed actions is expected to result in minimal ground disturbance, and the vertical APE is therefore anticipated to be no more than 6 inches below ground surface. FEMA consulted with SHPO regarding the APE determination and requested SHPO's concurrence in a letter dated February 4, 2011. SHPO concurred with FEMA's APE determination on April 19, 2011. Subsequent to that concurrence, the APE was expanded to include the connected project areas.

4.8.3.2 Built Environment

An indirect APE was also considered to account for potential effects on historic properties through effects to historic-period viewsheds, integrity aspects of setting and feeling, visual narrative, cohesiveness, and historic spatial relationships of potential historic properties outside the footprint of the proposed actions. A records search was conducted to identify eligible historic properties within 0.25 mile of the footprint that have the potential to be affected by the proposed action. Additionally, properties adjacent to the footprint were examined to characterize the setting, current land use, surrounding landscape and topography, and scale of development. General background research, as well as more intensive primary source searches, including examination of historical subdivision maps, USGS maps, plat maps, and historical East Bay newspaper and press publications, were conducted to gain an understanding of the history of the project area, identify character-defining features of the neighborhoods, and identify the characteristics that could contribute to the potential importance of the properties and their ability to convey a specific time, period, or place. Reconnaissance-level field surveys documented views from and toward the footprint.

Based on this review, FEMA determined that the indirect APE would be congruent with the direct APE. FEMA consulted with SHPO regarding the APE determination and requested SHPO's concurrence in a letter dated February 4, 2011. SHPO concurred with FEMA's APE determination on April 19, 2011.

4.8.4 Historic Properties Identification Methodology, and Archaeological and Built Environment Resources Identified in the Area of Potential Effect

4.8.4.1 Archaeology

4.8.4.1.1 Background Research

A literature search was conducted at the Northwest Information Center of the California Historical Resources Information System on September 7, 2012. The literature search provided data on previous studies and previously recorded resources within the APE and a 1-mile radius. Of 270 previous studies conducted within a 1-mile radius, a total of 32 have occurred within the APE. Of 144 previously recorded sites within a 1-mile radius, 14 sites are mapped within the APE (Table 4.8-1). In addition to the Northwest Information Center, data were reviewed from the EBRPD cultural resources database. The EBRPD database described an additional 24 locations where it was believed cultural resources are present but which have not been formally recorded or evaluated (EBRPD 2009e).

FEMA has previously conducted two cultural resources investigations in the APE: covered portions of the current APE in EBRPD (FEMA 2000) and the Strawberry Canyon-PDM and Claremont-PDM project areas (FEMA 2006c). Both of FEMA's previous investigations were negative for cultural resources.

Table 4.8-1. Previously Recorded Cultural Resources Sites within the EBH EIS APE

Site Number	Site Type	Site Description	NRHP Evaluation/Year Determined
P-01-000158	Historic	Grass Valley Trail	Not evaluated
P-01-002182	Historic	Equestrian Center/Facility	Not evaluated
P-01-002183	Historic	Fence and posts	Not evaluated
P-01-002184	Historic	Fence and posts	Not evaluated
P-01-002185	Historic	Fence and posts	Not evaluated
P-01-010576	Prehistoric	The Western Messenger Petroglyphs	Not evaluated
P-01-010597	Prehistoric	Bone fragments	Not evaluated
P-07-000163	Prehistoric	Midden and burials	Eligible/1983
P-07-000323[(1)]	Multicomponent	Alvarado Park/Wildcat Canyon Regional Park	Listed/1992
P-07-000799/ P-01-002179	Historic	Redwood Valley Rail Road/Tilden Steam Trains	Eligible/2000
P-07-000800	Historic	Refuse scatter	Not eligible/2000
P-07-000801	Historic	Water pipe	Not evaluated
P-07-000802	Historic	Tilden Archers Club/ Archery Range foundation slab	Not evaluated
P-07-002738	Historic	Dornan Drive Tunnel/Gerard Blvd Tunnel	Eligible/2004

Source: North Coast Information Center et al. 2008.

[(1)] Contains multiple individual features and components.

4.8.4.1.2 Survey Methods

A systematic intensive-level pedestrian survey for archaeological resources was conducted in the APE from October 15 to November 2, 2012. Site records for previously recorded resources were updated where appropriate and new California Department of Parks and Recreation (CDPR) 523 forms were completed for newly recorded resources.

The California Historic Resources Information System Information Center Rules of Operation Manual (North Coast Information Center et al. 2008) defines a site as the location of a prehistoric or historic occupation or activity. Areas with five or more items were recorded as sites while areas with four or less items were recorded as isolated occurrences. Cultural features were recorded as sites. Resources separated by more than 50 meters or located on different landforms were recorded as distinct sites or as isolates.

A total of 13 archaeological resources were observed and located partially or completely within the APE during the cultural resource survey; five of these were newly recorded (S-GC-1, S-GC-2, S-GC-3, S-PR-1, and tihs006) (Table 4.8-2). Of the resources mapped by the Northwest Information Center and EBRPD, 24 entries were found to not be cultural resources when revisited in the field, or no resources of any kind were observed at their mapped locations within the APE. These include previously recorded resources P-01-2183, P-01-2184, P-01-2185, P-01-010586, P-01-010597, P-07-000163, and P-07-000800 as described in Table 4.8-1 above.

4.8.4.2 Built Environment

A reconnaissance-level architectural survey for built environment resources was conducted of the entire APE from October 15 to November 2, 2012. The reconnaissance survey focused on

identifying and recording all prominent visible built environment features of the accessible landscape. A total of 25 architectural resources comprising districts, sites, and features were observed within the APE and are summarized in Table 4.8-2 below. Twenty-one new individual historic architectural resources were recorded as a result of the reconnaissance survey.

Table 4.8-2. Cultural Resources Observed in the EBH APE

Site Number/Name	Site Type	Site Description	Notes
		Prehistoric and Historic Archaeological Sites	
P-1-00158	Historic	Grass Valley Trail	-
CA-CCO-125 / Alvarado Park P-07-000323	Prehistoric	Cupules and midden (element of Alvarado Park)	-
CA-CCO-274 / Alvarado Park P-07-000323	Prehistoric	Habitation and midden (individual element of NRHP-listed Alvarado Park)	-
CA-CCO- 349 / Alvarado Park P-07-000323	Prehistoric	Possible midden and burials (individual element of NRHP-listed Alvarado Park)	-
CA-CCO-353 / Alvarado Park P-07-000323	Prehistoric	Midden (individual element of NRHP-listed Alvarado Park)	-
CA-CCO-373 / Alvarado Park P-07-000323	Prehistoric	Midden (individual element of NRHP-listed Alvarado Park)	-
P-07-00801	Historic	Water irrigation pipe	-
P-07-00802	Historic	Tilden Archery foundation remnant	-
S-GC-1 (formerly EBRPD's mkhs002)	Historic	WWII Gun Emplacements	-
S-GC-2	Historic	Stone lined drainage	-
S-GC-3	Historic	Redwood Creek Stone features	-
S-PR-1 (formerly URS EBH-7)	Historic	springbox and walls	-
EBRPD's tihs006	Historic	20th Century Water System Remnant	-
		Architectural Sites/Features	
Alvarado Park P-07-000323	Historic Architecture	Park District	-
Anthony Chabot Regional Park	Historic Architecture	Park District	-
5750 Redwood Road Oakland	Historic Architecture	Skyline Ranch Equestrian Center	Feature in Anthony Chabot Regional Park
14600 Skyline Blvd.	Historic Architecture	Anthony Chabot Equestrian Center	Feature in Anthony Chabot Regional Park
9999 Redwood Road, Castro Valley, CA	Historic Architecture	Marksmanship Range-Gun rifle range	Feature in Anthony Chabot Regional Park
Tilden Regional Park	Historic Architecture	Park District	-
Volmer Peak Nike Radar/2501 Grizzly Peak Blvd.	Historic Architecture	Nike Radar Facilities/Towers/EBRPD Corporation Yard	Feature in Tilden Regional Park

Table 4.8-2. Cultural Resources Observed in the EBH APE

Site Number/Name	Site Type	Site Description	Notes
S-MV-3	Historic Architecture	Lake Anza Park Residence	Feature in Tilden Regional Park
tihs026	Historic Architecture	Botanic Gardens	Feature in Tilden Regional Park
T-S-PR-5	Historic Architecture	Water Conveyance System	Feature in Tilden Regional Park
tihs011	Historic Architecture	Tilden Golf Course	Feature in Tilden Regional Park
P-07-000799/P-01-002179	Historic Architecture	Steam Trains	Feature in Tilden Regional Park
Claremont Canyon Regional Preserve	Historic Architecture	Park District	-
Huckleberry Botanic Regional Preserve	Historic Architecture	Park District	-
Kennedy Grove Regional Recreation Area	Historic Architecture	Park District	-
Miller/Knox Regional Shoreline Historic District	Historic Architecture	Park District	-
810 Dornan Dr.	Historic Architecture	Bernardi House	Feature in Miller/Knox Regional Shoreline
mkhs003/S-MV-1	Historic Architecture	Nicholl Knob observation site	Feature in Miller/Knox Regional Shoreline
Leona Canyon Regional Open Space Preserve	Historic Architecture	Park District	-
734 Gelston Ave.	Historic Architecture	Park Residence/Offices	-
Point Pinole Regional Shoreline	Historic Architecture	Park District	-
Redwood Regional Park	Historic Architecture	Park District	-
8500 Skyline Blvd	Historic Architecture	Park residence	Feature in Redwood Regional Park
10900 Skyline Blvd.	Historic Architecture	Redwood Bowman Archery Range	Feature in Redwood Regional Park
S-MV-2	Historic Architecture	Park Residence adjacent to Archery Range	Feature in Redwood Regional Park
11500 Skyline Blvd.	Historic Architecture	Trudeau Training Center	Feature in Redwood Regional Park
6525 Redwood Road	Historic Architecture	Piedmont Stables	Feature in Redwood Regional Park
P-01-002182	Historic Architecture	Huntsfields Equestrian center	Feature in Redwood Regional Park
Sibley Volcanic Regional Preserve	Historic Architecture	Park District	-
6800 Skyline Blvd	Historic Architecture	Park Residence , Interpretive Area and Stone features	Feature in Sibley Volcanic Regional Preserve

Table 4.8-2. Cultural Resources Observed in the EBH APE

Site Number/Name	Site Type	Site Description	Notes
Sobrante Ridge Regional Preserve	Historic Architecture	Park District	-
Strawberry Canyon	Historic Architecture	Park District	-
Temescal Regional Recreation Area	Historic Architecture	Park District	-
Wildcat Canyon Regional Park	Historic Architecture	Park District	-

Multiple historic parks are partially located within the APE, and several are potentially eligible for listing to the NRHP as historic districts. Alvarado Park, Anthony Chabot Regional Park, Tilden Regional Park, Claremont Canyon Regional Preserve, Huckleberry Botanic Regional Preserve, Kennedy Grove Regional Recreation Area, Miller/Knox Regional Shoreline, Leona Canyon Regional Open Space Preserve, Point Pinole Regional Shoreline, Redwood Regional Park, Sibley Volcanic Regional Preserve, Sobrante Ridge Regional Preserve, Strawberry Canyon, Temescal Regional Recreation Area, and Wildcat Canyon Regional Park are all within the APE.

Following the guidance provided in the California Office of Historic Preservation *Instructions for Recording Historical Resources* (1995), the 14 parks that are within the APE are each large and complex landscapes. One, Alvarado Park, was listed on the NRHP in 1992. As such, 13 of the 14 parks have been recorded as a district due to their concentration of buildings and structures united historically and functionally by plan and physical development. CDPR forms, including a Primary Record, Building, Structure, Object, and Record, Location Map, Sketch Map, and Continuation Sheet, and District Record, were prepared to document each district as a whole. Five parks (Anthony Chabot Regional Park, Tilden Regional Park, Miller/Knox Regional Shoreline, Redwood Regional Park, and Sibley Volcanic Regional Preserve) had structures located within the APE, and those 14 individual structures were evaluated and recorded on Building, Structure, Object, and Record forms as part of the overall district record.

No structures are known to occur within the remaining nine parks based on the reconnaissance level inventory of the accessible landscape, review of aerial and topographic maps, and results of archival research.

4.8.4.3 Institutions, Agencies, Groups, and Individuals Contacted

4.8.4.3.1 Native American Consultation

Pursuant to the revised implementing regulations of the National Historic Preservation Act, found at 36 CFR § 800.4(a)(4) and the 2005 First Amended Agreement among FEMA, the SHPO, Cal EMA, and the Advisory Council on Historic Preservation, FEMA contacted the California Native American Heritage Commission and requested a search of the California Native American Heritage Commission's Sacred Lands file on multiple occasions during development of this draft EIS. These searches did not indicate the presence of Native American

cultural resources within 1 mile of the APE. The record searches conducted at the California Historical Resources Information System also did not indicate the presence of Native American traditional cultural properties. Federal government-to-government consultation with Native Americans is also being conducted by FEMA for the APE. Copies of Native American Heritage Commission (NAHC) correspondence are included in Appendix A. Below is a summary of NAHC and tribal consultation.

On July 7, 2006 and August 30, 2007, LSA Associates, Inc. requested that a Sacred Land File search be conducted and requested a contact list for interested Native Americans for the EBRPD Wildfire Hazard Reduction and Resource Management Plan Project. At this time, the project was not considered a federal undertaking and work was conducted in support of the California Environmental Quality Act.

On October 1, 2010, URS Groups, Inc. contacted the NAHC to request a review of its Sacred Lands File and to receive a list of the individuals and groups that the NAHC believes should be contacted regarding information or concerns related to the APE. This request was in support of the Hazardous Fire Risk Reduction Environmental Impact Statement, East Bay Hills, California Project. For this phase of work, the project received federal funding and was regarded as a federal undertaking; the consultation was conducted in support of NEPA and Section 106. Letters to potential interested individuals and groups listed by the NAHC were sent on November 23, 2010. No responses have been received to date of this report.

On September 7, 2012, CH2M HILL contacted the NAHC and asked that they provide a list of Native American contacts that may be interested in the APE. The list provided did not identify any federally recognized tribes. The Bureau of Indian Affairs and the U.S. Department of Housing and Urban Development databases of federally recognized tribes were consulted and no federally recognized tribes are listed for the APE geography. FEMA has not identified any federally recognized tribes with cultural affiliation to the APE geography. Upon completion of the draft EIS, FEMA will send another round of letters to notify the tribal individuals and groups identified by the NAHC, of the opportunity to comment and review. Additionally, tribes, groups, and interested individuals will have the opportunity to comment on the undertaking during the public comment period for the draft EIS.

4.8.4.3.2 California State Historic Preservation Officer

In accordance with Stipulation VII.A of the 2005 First Amended Programmatic Agreement among FEMA, the State Historic Preservation Officer, the California Emergency Management Agency, and the Advisory Council on Historic Preservation, FEMA has conducted a historic properties assessment of the APE.

For the purpose of this undertaking, FEMA initiated NHPA Section 106 consultation with the California SHPO on February 4, 2011. On March 13, 2013, SHPO was notified of FEMA's finding of No Adverse Effect to Historic Properties Determination. Consultation is ongoing.

4.8.5 Traditional Cultural Properties Identified in the Area of Potential Effect

No traditional cultural properties were identified in the APE.

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4.9 Aesthetics and Visual Quality

This section describes the visual characteristics of the proposed and connected project areas and views that could be affected by the proposed and connected actions and the no action alternative. A discussion of visual sensitivity classifications is also included.

4.9.1 Regulatory Setting

4.9.1.1 Federal

FEMA does not have regulations or specific guidance on how to evaluate impacts to visual resources.

4.9.1.2 State

4.9.1.2.1 State Scenic Highways

The goal of the California Scenic Highway Program is to preserve and enhance the state's natural scenic resources. The laws governing the program establish the state's responsibility to protect and enhance the state's scenic resources by identifying portions of the state highway system and adjacent scenic corridors that require special conservation treatment. The California Department of Transportation (Caltrans) manages the Scenic Highway Program, but responsibility for development along scenic corridors lies with the local government (Caltrans 2012b). The program is applicable to visual resources throughout the proposed and connected project areas as seen from state scenic highways. Skyline Boulevard, Grizzly Peak Road, and Tunnel Road as noted below in Section 4.9.1.3.2 were designated by the City of Oakland (Oakland) as a scenic route (corridor) in 1973 subject to the California Scenic Highway Program.

4.9.1.3 County and Municipal

4.9.1.3.1 East Bay Regional Parks Department

EBRPD administers five types of parks: regional park, regional preserve, regional recreation area, regional shoreline, and regional trail. Each type has a specific purpose and corresponds to particular use and resource protection strategies. A description of each type, as defined in the *East Bay Regional Parks Master Plan* (1996), is provided below:

- *Regional Park*: A regional park is a "spacious land area with outstanding natural features." It must measure 500 acres or more, including land and water. A regional park must have scenic or natural resources in at least 70% of its area. Portions of the proposed and connected project areas are in the following regional parks:
  - Wildcat Canyon Regional Park
  - Redwood Regional Park
  - Tilden Regional Park
  - Anthony Chabot Regional Park
  - Lake Chabot Regional Park

- *Regional Preserve*: A regional preserve is an area with "outstanding natural or cultural features that are protected for the intrinsic value, as well as for the education of the public." A regional park must contain open space, wilderness, scenic beauty, flora, fauna, or archaeological, historic or geological resources. Portions of the proposed and connected project areas are in the following regional preserves:
  - Sobrante Ridge Regional Preserve
  - Claremont Canyon Regional Preserve
  - Sibley Volcanic Regional Preserve
  - Huckleberry Botanic Regional Preserve
  - Leona Canyon Regional Open Space Preserve
- *Regional Recreation Area*: A regional recreation area provides a variety of outdoor recreation opportunities, including picnicking, swimming, fishing, camping, or boating. The proposed Caldecott Tunnel-PDM project area is part of a regional recreation area.
- *Regional Shoreline*: A regional shoreline provides significant recreational, interpretive, natural, or scenic values on land, water, and tidal areas along the San Francisco Bay. Such areas may include upland areas that can be used for interpretive purposes. The Miller/Knox project area is part of the Miller/Knox Regional Shoreline.
- *Regional Trails*: Regional trails provide nonmotorized, multiple-use, pedestrian, equestrian, and bicycling connections between EBRPD parks. These trails also link EBRPD parks with other local parks, open spaces, trails, transportation and employment centers, and urban communities. Regional trails traverse a wide variety of terrain, ranging from urban streets to open range lands, irrigation canal banks, utility corridors, and former railroad rights-of-way.

4.9.1.3.2 Oakland

The Scenic Highway Element of the City of Oakland Comprehensive Plan and the Open Space Conservation and Recreation and the Land Use and Transportation elements of the City of Oakland's General Plan contain land use policies that affect aesthetics and visual quality in the proposed and connected project areas. A description of the planning documents and their effect on aesthetics and visual quality is provided below:

- *Scenic Highway Element of the City of Oakland Comprehensive Plan*: Skyline Boulevard, Grizzly Peak Road and Tunnel Road traverse the ridgeline along the eastern edge of Oakland. The route created by these three roadways was designated by Oakland as a scenic route (corridor) in 1973. The Scenic Highway Element of the City of Oakland Comprehensive Plan adopted in 1974 outlines multiple land use policies designed to maintain scenic quality along the route, including building height limits, access road development limits, and landscape preservation requirements (Oakland 1974).
- *Open Space Conservation and Recreation Element of the City of Oakland General Plan:* The 1996 Open Space Conservation and Recreation Element of the General Plan outlines a series of policies on the management of parklands and open space. These policies included requirements for avoiding net loss of parkland within the city limits, restrictions on new building heights, and landscaping guidelines (Oakland 1996).

- *Land Use and Transportation Element of the City of Oakland General Plan:* The 1998 Land Use and Transportation Element of the General Plan outlines land use classifications in the proposed and connected actions that guide use type, structure density, intensity, and character. These classifications include lands identified for resource conservation and urban park and open space. Development of lands identified for resource conservation is extremely limited while on land specified as urban park and open space development of new facilities is more permissible, within the confines of the city's no net loss policy for open space and parklands (Oakland 1998).

4.9.1.3.3 UCB

The UCB *2020 Long Range Development Plan* (2005) establishes a framework for land use at its campus. These lands include the Hill Campus and the Lawrence Berkeley National Laboratory, both east of the central Campus Park. The Long Range Development Plan identifies multiple locations within the Hill Campus area where future development of facilities, not disadvantaged by the distance from the central Campus Park, could potentially be developed, including faculty housing. The plan identifies these locations as less promising than other near-term options that would need to be considered before areas in the Hill Campus currently identified as reserve sites could be converted for this use. The plan also establishes land use policy for the Hill Campus area to maintain the visual primacy of the natural landscape and to manage the landscape to reduce the risk of fire and flood and to restore native vegetation and hydrology patterns (UCB 2005).

4.9.2 Methodology

4.9.2.1 Proposed Project Area

The proposed project area for visual resources includes the proposed and connected project areas and associated parks, reserves, or open space administered by one of three subapplicants: EBRPD, UCB, and Oakland, and adjacent developed areas including roadways, residential neighborhoods, and urbanized areas. This section describes existing visual resources within the proposed project area and includes baseline information for assessing changes in visual modification class.

4.9.2.2 Landscape Setting

The proposed project area is situated in two distinct geographic areas: the East Bay Hills and Miller/Knox Regional Shoreline (Figure 4.9-1). The portion of the proposed project area in the East Bay Hills is distributed across 21 miles of San Pablo Ridge and the Berkeley, Oakland, and San Leandro Hills, and includes proposed and connected project areas in 15 parks, preserves, and other open space areas administered by EBRPD, UCB, and Oakland. The proposed and connected project areas are along the northeast and southwest facing slopes at varying elevations (approximately 40 to 1,700 feet). The Miller/Knox Regional Shoreline portion of the proposed project area is on Point Richmond, adjacent to San Francisco Bay. Land uses in the developed areas of the proposed project area adjacent to the proposed and connected project areas include residential, commercial, institutional (UCB), and industrial use.

4.9.2.3 Assessment of Existing Conditions

The assessment of existing conditions included two components: sensitivity level analysis and visual resource assessment. The sensitivity level analysis entailed identifying the primary viewer groups (e.g., residents, recreationists) and classifying each group according to its expected sensitivity to changes in visual conditions. Sensitivity was ranked as high, moderate, low, or "no sensitivity" based on the criteria adopted from Headley (2010); these criteria are summarized below:

- *High sensitivity* – great potential for the public to react strongly to any lessening of visual quality
- *Moderate sensitivity* – substantial potential for the public to voice some concern over visual impacts of moderate to high intensity
- *Low sensitivity* – small minority of the public may have a concern over scenic and visual resource impacts on the affected area
- *No sensitivity* – no sensitivity because the potentially affected views are not accessible to the general public or because there are no indications that the affected views are valued by the public

Prior to initiating the visual assessment of the proposed project area, a preliminary review of the area was completed to identify similarities in visual resources across the proposed and connected project areas. The review focused on broad classifications of landscape character. Based on the results of the preliminary review, each project area and associated space was assigned to a landscape character type. These landscape character types were determined by the land use in the foreground distance zone. The foreground distance zone is 0.5 to 3 miles.

Each landscape character type is summarized below:

- *Urban-industrial-parkland*: The urban-industrial-parkland character type refers to those areas where parklands (parks, open space, or reserves) are bordered by urban and industrial land uses within the foreground distance zone.
- *Residential-parkland*: The residential-parkland character type refers to those areas where parklands (parks, open space, or reserves) are bordered by residential areas within the foreground distance zone.
- *Urban-parkland:* The urban-parkland character type refers to those areas where parklands (parks, open space, or reserves) are bordered by high density commercial and residential development within the foreground distance zone.

Important viewing points were then identified to represent common views experienced by sensitive viewers in each landscape character type. Selection of viewing points focused on views from and views of proposed and connected project areas either within the treatment areas or at a distance from the treatment areas where a noticeable contrast between the before and after condition would be noticeable. Each viewing point was selected in part to represent a class of views common across these proposed and connected project areas. Visual resources were quantified at each viewing point using the Bureau of Land Management's (BLM's) visual assessment procedures (BLM 1987) and the visual modification class approach. This approach

provided the framework to record broad qualities of the landscape, such as landscape type, character, and analysis factors, as well as information on visual access, or the physical conditions under which a view is experienced. Visual access overlaps to some extent with visual sensitivity, as it describes viewing conditions, such as viewer angle, duration, and distance of the viewer to the focal view. The types of data collected at each viewing point are described below:

- *Landscape type*: Types of landscapes include panoramic, enclosed, feature, focal, and canopied. The specific landscape type may influence the capacity of the landscape to absorb changes without a reduction in visual quality.
- *Landscape character*: The character of the landscape is the overall impression created by its unique combination of visual features, including land, vegetation, water, and structures. Landscape character was determined by assessing the basic character elements of form, line, color, and texture of landform, vegetation, and structures.
- *Landscape analysis factors*: Landscape analysis factors include contrast, sequence, axis, convergence, co-dominance, enframement, and scale.
- *Viewer duration*: Viewer duration refers to the amount of time the view is seen. Residents experience prolonged views whereas roadway travelers experience transient views.
- *Viewer angle of observation*: The angle of observation refers to the primary angle at which a view is observed. For example, residents may experience views directly in front of them or at a 180° arc. Roadway travelers may experience views at a 90° angle.
- *Distance zones*: Distance zones refer to the distance of the viewer from the target view and are classified as immediate foreground (<0.5 miles), foreground (0.5 to 3 miles), middleground (3 to 5 miles), and background (5 to 15 miles).

Visual resources (landform, vegetation, and structures) at each viewing point were then described in terms the basic elements of form, line, color, and texture and assigned to a visual modification class based on the overall congruence and coherence of the proposed or connected project area and associated space. Congruence was defined as the degree to which past actions have noticeably and unfavorably changed landscape features or introduced incompatible features such that the results appear incongruent with the inherent character of the area. Coherence was defined as the degree of current internal consistency and harmony of landscape features that may have been affected by past actions. For example, a landscape may be “intact” relative to the type of features within view, yet past actions may have resulted in there being little to no discernible pattern, composition, or harmony associated with those features (Headley 2010). Congruence and coherence were scored as follows: (1) not noticeable, (2) noticeable but subordinate, (3) co-dominant, or (4) dominant. Based on the assessment, each viewing point was assigned to a visual modification class based on the following criteria:

- *Visual modification class 1*: Not Noticeable – Landscapes are of the highest quality. All noticeable features in view appear congruent and are coherently arrayed. Any adverse changes of landscape features in the past would not be noticed unless pointed out.
- *Visual modification class 2*: Noticeable, Visually Subordinate – Adverse changes in landscape features that have occurred in the past attract some attention but do not compete for attention with other features in the field of view.

- *Visual modification class 3*: Distracting, Visually Co-Dominant – Adverse changes in landscape features that have occurred in the past appear incongruous or incoherently arrayed to the point that they are distracting and compete for attention with other features in view.
- *Visual modification class 4*: Visually Dominant, Demands Attention – Landscapes are of the lowest quality. Adverse changes in landscape features that have occurred in the past appear incongruous or incoherently arrayed to the point that they are the focus of attention.

Visual survey worksheets and detailed location maps for each viewing point are provided in Appendix E.

4.9.3 Existing Conditions

4.9.3.1 Sensitivity Level Analysis

Sensitive viewers include residents, recreational users (hikers, cyclists, equestrians), institutional viewers (university students and staff), roadway travelers (interstate, state, and local roads), and industrial workers. All viewer groups experience views of proposed and connected project areas from varying distance zones, viewer angles, and duration. Residents situated adjacent to parkland areas (primarily residential-parkland landscape character type) experience prolonged views and consequently are assumed to have grown accustomed to certain ideas of how the landscape should appear. Institutional viewers would experience similar views; however, this demographic is expected to be more transient and less focused on specific landscape character elements. Recreational users include residential and institutional viewers and visitors. It is expected that recreational users seek a specific aesthetic and would be sensitive to most changes to the area. Recreational users who reside locally and frequent the proposed project area are expected to have more established expectations of views as they may visit the same location many times over or rely on specific landscape components for their sense of place. Roadway travelers, including resident commuters and tourists, experience views at varying speeds and angles of observation. For all viewer groups, sensitivity is expected to increase with proximity to the proposed project area. Sensitivity for residential, institutional, and recreational viewers and roadway travelers is expected to be high based on the following situations:

- Views of and from areas where the aesthetic value is protected in public planning documents
- Views of and from community parks, trails, interpretive sites, and recreation areas
- Views from urban residential subdivisions and segments of roads that serve as their primary access route
- Views from segments of travel routes (e.g., roads, pedestrian trails, bicycle paths) that serve as the primary access to designated areas of aesthetic, recreational, and scientific interest

Industrial workers, in contrast, are characterized by moderate to low sensitivity. It is assumed that this viewer group is not focused on visual resources of the area when engaged in daily activities.

4.9.3.2 Landscape Character Type

Proposed and connected project areas and associated spaces were categorized as urban-industrial-parkland, residential-parkland, and urban-parkland landscape character types, as shown in Table 4.9-1.

Table 4.9-1. Landscape Character Types of Parks Containing Proposed and Connected Project Areas

Applicant	Urban-Industrial-Parkland	Residential-Parkland	Urban-Parkland
EBRPD	Miller/Knox Regional Shoreline	Wildcat Canyon, Tilden, Redwood, and Anthony Chabot Regional Parks; Sibley Volcanic, Huckleberry Botanic, and Sobrante Ridge Regional Preserves	Claremont Canyon Regional Preserve, Leona Canyon Regional Open Space Preserve, and Lake Chabot Regional Park
UCB	N/A	Frowning Ridge-PDM	Strawberry Canyon-PDM and Claremont-PDM
Oakland	N/A	N/A	Frowning Ridge-PDM, North Hills-Skyline-PDM, and Caldecott Tunnel-PDM

N/A: Not Applicable

Landscape character types are described in the following sections.

4.9.3.2.1 Urban-Industrial-Parkland Character Type

One park containing proposed project areas is of the urban-industrial parkland landscape character type—the Miller/Knox Regional Shoreline owned by the EBRPD. The park includes expansive open space on the northeast-southwest trending ridgelines of two prominent hills. Vegetation along the ridgelines is dominated by grasslands, with sparsely distributed trees and shrubs. More contiguous patches of mature trees are present in the northern proposed project areas and correspond to a distinct ridgeline north of Keller's Beach Park. The hills provide a topographic break separating the predominantly commercial and industrial areas to the east from the more natural residential and park areas to the west. The large hills of the Miller/Knox Regional Shoreline are central to the landscape character and are the dominant landforms of the Point Richmond area. Views of and from the proposed project areas are accessed through local roads and trails.

The proposed project areas within the park encompass the ridgelines of Miller/Knox Regional Shoreline and a small area on the west slope of Miller/Knox Regional Shoreline. Vegetation within the proposed project areas range from open grassland-shrub communities to dense stands of mature eucalyptus and Monterey pine.

Views of the proposed project areas include those experienced by recreators, roadway travelers, residents, and commercial and industrial workers and include a range of viewing distances. Viewed from nearby roads (Brickyard Cove Road or Dornan Drive), residential areas, or from other points within the Miller/Knox Regional Shoreline, the landscape character appears enclosed, largely due to the low viewer position relative to the hills and the limited field of view created by the proximity to the steep slopes. Views of the proposed project areas may be transient, as seen from roadways, or prolonged, as seen from residents or locations along the shoreline. It is expected that views of the proposed project areas would be seen at an angle, and

that the attention of viewers in these locations is drawn away from the proposed project areas toward the San Francisco Bay. Although views of the project areas are not expected to dominate views from within the foreground distance zone, these areas do enhance the natural character of the area and create a distinct physiographic break between developed areas surrounding the Miller/Knox Regional Shoreline project areas.

However, when seen from middleground and background locations (e.g., boats in San Francisco Bay, roads), the proposed project areas are seen as part of the hills on which they are located, which are distinct from the surrounding flat topography of the coastal plain, and natural areas provide contrast to surrounding industrial lands. Vegetation communities are less discernible from these distances.

4.9.3.2.2 Residential-Parkland Character Type

The residential-parkland landscape character type is assigned to the natural areas extending from Alvarado Park at the northern terminus of Wildcat Canyon Regional Park and south to Anthony Chabot Regional Park. Six regional parks administered by EBRPD are included in this character type: Wildcat Canyon Regional Park, Tilden Regional Park, Sibley Volcanic Regional Preserve, Huckleberry Botanic Regional Preserve, Redwood Regional Park, and Anthony Chabot Regional Park. This character type is also found in one area in Oakland owned by UCB: Frowning Ridge-PDM area.

The regional parks listed above are situated on the northeastern side of the East Bay Hills and encompass the extensive drainage basins of Wildcat, San Leandro, and Redwood Creeks. The prevailing topography includes prominent ridgelines and valleys trending in a northwest-southeast direction. The western-most ridgeline of the East Bay Hills provides a barrier that obstructs views from parkland areas of residential and urban areas located to the southwest. Vegetation includes a mosaic of open grassland and shrub communities, punctuated by isolated patches of dense forest. Shrubs are generally associated with drainages, forming distinct sinuous lines that may extend from ridgeline to valley bottom. Larger patches of forest are clumped and enhance the vertical relief created by the ridgelines. More continuous hardwood vegetation communities are common along the western edge of the parks, adjacent to residential communities that border each regional park. Views of and from the proposed project areas are accessed through local roads and trails.

Views from within the proposed project areas are primarily experienced by recreators who access the parkland interior through a network of roads and trails. Available views are generally represented by two types: those experienced from high positions, such as the tops of hills, and those experienced from trails in the park. Views experienced from high points offer a 360° panorama that includes San Francisco Bay, the City of San Francisco, the iconic Bay and Golden Gate Bridges to the west, and open space to the east. Foreground and middleground views include the cities of Richmond, Berkeley, Oakland, San Leandro, and Castro Valley, and the contrasting edge of the urban-residential interface. When viewed from a high vantage point, the vegetation appears as a mosaic of community types, ranging from open grassland to patches of mature forest.

Views from the proposed and connected project areas of the EBRPD system include enclosed or canopied landscape types. Canopied landscape types are experienced from within patches of mature eucalyptus or Monterey pine forests. These areas are distinct and contribute to the sense of isolation created by the visual environment. The grass-shrub vegetation communities allow for more open middleground views within the parks; however, the combination of the vertical relief of local topography and patches of trees reduces the overall scale of the landscape and maintains a sense of enclosure and separation from adjacent residential and urban areas.

Views of the proposed and connected project areas are primarily experienced by residents and recreators and vary based on predominant vegetation form (tree, shrub, grassland), and the distance of the area from the viewer. For example, areas dominated by mature trees may impart a high degree of enclosure to landscapes experienced by individuals nearby. That same area, when viewed from an intermediate distance, may lack that element of enclosure from the mature trees. Instead, the mature stands contribute to the overall mosaic of vegetation types observed within a larger setting.

4.9.3.2.3 Urban-Parkland Character Type

The urban-parkland interface character type describes parkland areas that interface directly with urban areas but without any distinct topographical break. Instead, barriers between the urban-parkland interfaces are typically mature trees. These large-stature trees become less of a visual barrier with increasing elevation. These areas are located on the western side of the East Bay Hills and include the EBRPD administered Claremont Canyon Regional Preserve, Leona Canyon Regional Open Space Preserve; the Frowning Ridge-PDM, North Hills-Skyline-PDM, and Caldecott Tunnel-PDM areas administered by Oakland, including the North Hills-Skyline-PDM and Caldecott Ballfields; and the Lake Chabot Regional Park, Claremont-PDM, and Strawberry Canyon-PDM areas, administered by UCB.

Views from within the proposed and connected project areas are accessed through a network of trails and fire roads and include panoramic, enclosed, and canopied landscape types. Panoramic views to the west include the San Francisco Bay, the City of San Francisco skyline, the Bay and Golden Gate Bridges, the towers at Mount Sutro and Twin Peaks, Angel Island, and Treasure Island. The expansive waters of San Francisco Bay, combined with the iconic features that surround it, command the attention of the viewer and dominate views from the East Bay Hills.

Views from locations such as residential areas and institutional buildings range from expansive views across open areas to views with a high degree of enclosure caused by large trees. High contrast exists between urban areas and adjacent parkland, including the proposed and connected project areas.

Views of the proposed project areas from more distant (background distance zone) viewer locations, such as major travel ways, San Francisco Bay, or the City of San Francisco, lack the resolution of closer locations; however, the prominence of the East Bay Hills provides enclosure to the San Francisco Bay and contributes to the overall unity of the view.

4.9.3.3 Visual Modification Class

Twenty-one important viewing points were selected in the proposed project area (see Figure 4.9-1). As noted in Section 4.9.2.3, these important viewing points were selected based on their representation of common views experienced by sensitive viewers in each landscape character type and represent a class of views common across the proposed and connected project areas. The landscape type, sensitivity level, and visual modification class for each viewing point and the proposed and connected project areas visible from each viewing position are summarized in Table 4.9-2. A more detailed description of each viewing point is provided in Appendix E.

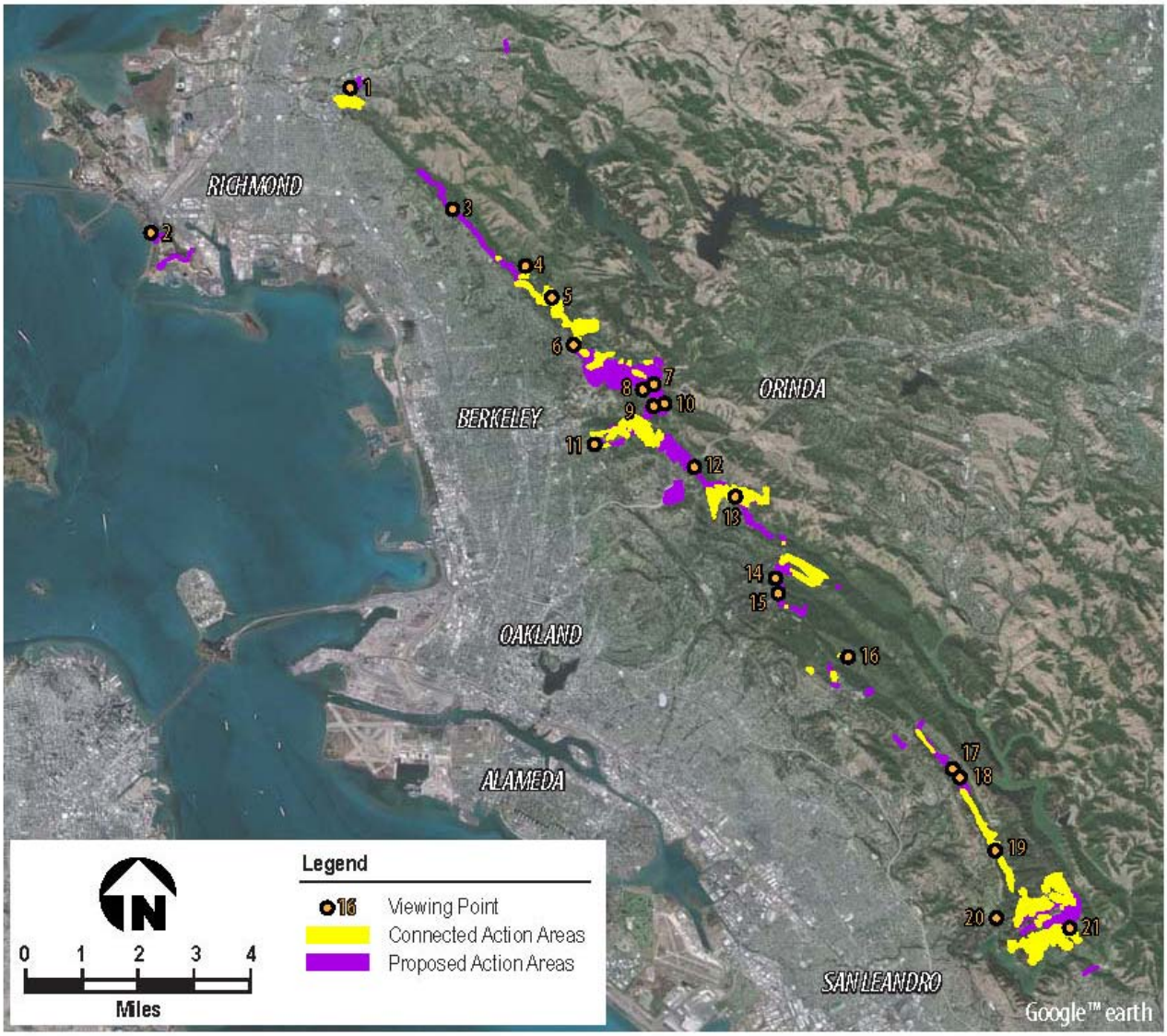

Figure 4.9-1. Important Viewing Points in the Project Area

Table 4.9-2. Viewing Point Survey Summary

Viewing Point ID	Landscape Character	Public Sensitivity	Visual Modification Class[1]	Relevant Project Areas[2]
1	Residential Parkland	High	1	SO001, WC003, WC004, WC005, WC006
2	Urban Industrial Parkland	High	2	MK001, MK003, MK004, MK005
3	Residential Parkland	Low	2	WC009, WC010, WC011
4	Residential Parkland	High	1	TI006
5	Residential Parkland	High	1	TI008a, TI008b, TI009, TI010
6	Residential Parkland	High	1	TI011, TI012, TI013, TI014,TI015,TI016, TI019, TI020, TI021
7	Urban Parkland	High	3	Strawberry Canyon-PDM, Frowning Ridge-PDM, TI014,TI015,TI016, TI019, TI020, TI021
8	Urban Parkland	High	2	Strawberry Canyon-PDM, Frowning Ridge-PDM
9	Urban Parkland	High	1	Strawberry Canyon PDM, Frowning Ridge-PDM, Claremont-PDM, North Hills-Skyline-PDM, CC001, CC002, CC003, CC004, CC005, CC006, CC007, CC008, CC009, CC011
10	Urban Parkland	High	2	Claremont-PDM
11	Urban Parkland	High	2	CC001, CC002, CC003, CC004, CC005, CC006, CC007, CC008, CC009
12	Urban Parkland	Moderate	3	North Hills-Skyline-PDM, Caldecott Tunnel-PDM, CC012, SR-001, SR-002, SR003, SR-004
13	Residential Parkland	High	1	SR005, SR006, SR007, HP001, HP002, HP003, HP004
14	Residential Parkland	High	2	RD001, RD002, RD003, RD004,
15	Residential Parkland	High	1	RD004, RD005, RD006, RD007, RD008
16	Residential Parkland	High	2	RD009, AC003
17	Residential Parkland	Moderate	2	AC006
18	Residential Parkland	Moderate	2	AC007
19	Residential Parkland	Moderate	2	AC007
20	Urban Parkland	High	2	AC010, AC011, AC012, AC013
21	Urban Parkland	High	2	AC010, AC013, AC014, LC010

[1] Visual Modification Class definitions are presented in Section 4.9.2.3.
[2] These areas are shown on Figures 3-1a through 3-1j in Section 3.

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4.10 Socioeconomics

This section describes existing socioeconomic conditions in the vicinity of the proposed and connected project areas and provides the baseline used in Sections 5.11 and 6.7 to compare the potential direct, indirect, and cumulative environmental impacts of the proposed and connected actions and the no action alternative. This description includes population demographics, housing characteristics, and the economic setting. In addition, special consideration is given to the identification of any minority communities and low-income communities in the study area, which includes populated areas near the proposed and connected project areas.

4.10.1 Regulatory Setting

4.10.1.1 Title 6 of the Civil Rights Act

Title VI of the Civil Rights Act prohibits discrimination on the basis of race, color, national origin, age, sex, or disability in programs and activities receiving federal financial assistance (Office of the Law Revision Council 2010).

4.10.1.2 Executive Order 12898

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires that federal agencies identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The executive order also tasks federal agencies with ensuring that public notifications regarding environmental issues are concise, understandable, and readily accessible.

As stated in EPA guidance, disproportionately high and adverse effects encompass both human health and environmental effects. Informed judgment needs to be exercised as to what effects are “disproportionate” as well as “high and adverse.”

4.10.1.3 California Government Code Section 65040.12(e)

California Government Code Section 65040.12(e) defines environmental justice as “the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies” (Office of Legislative Counsel 2010).

4.10.1.4 County and City General Plans

In the East Bay region, counties and cities regulate growth through their general plans, which provide goals and policies to guide current and long-term development in their communities. Relevant plans are described in Section 4.13.1.

4.10.2 Methodology

This section presents the methodologies used in characterizing existing socioeconomic conditions in the proposed project area. The socioeconomic factors examined include community character, residential property values, induced residential growth, and the potential for

environmental justice issues. Census data are presented for the larger region (Alameda and Contra Costa counties) and the smaller proposed project area (census tracts where appropriate) in order to identify any important contrasts.

The data presented were supplemented with information collected during neighborhood site visits in February 2011. These site visits were conducted in neighborhoods near the proposed and connected project areas to identify key community facilities (e.g., schools, recreation facilities, churches) and any significant parcels of undeveloped land adjacent to project areas where project-induced housing growth could occur. In addition, these site visits revealed that the community areas with the potential to be affected by proposed activities are small. In all cases, it was determined that potential community effects would extend only one or two streets into communities adjacent to park and open space areas where the proposed and connected actions would occur. Therefore, these site visits were also used to ensure that the data presented at the census tract level (as well as the block group level, where applicable) are representative of the smaller neighborhood areas adjacent to the proposed and connected project areas. The census tracts associated with the proposed and connected project areas are shown in Table 4.10-1.

Table 4.10-1. Census Tracts Associated With the Proposed and Connected Project Areas in 2010

County	Census Tract	Population
Alameda County	4216	3,558
	4226	1,215
	4001	2,937
	4044	5,314
	4045.02	5,784
	4046	4,353
	4080	2,671
	4081	5,991
	4227	4,885
	4100	2,805
	4099	3,308
	4237	3,633
	4215	3,640
	4211	1,922
	4301.02	2,285
	4303	3,670
	4304	2,046
Total		**60,017**
Contra Costa County	3780	3,435
	3690.02	2,548
	3610	4,475
	3601.02	4,326
	3560.02	5,375
	3920	2,451
	3540.01	1,859
	3530.01	3,521
	3522.02	2,548
	3620	2,767
	3851	2,765
Total		**36,070**

Source: U.S. Census Bureau 2010

4.10.2.1 Community Character

Community character is defined by the local population demographics, housing characteristics, and economy. This section describes the community character of both the region and census tracts in the proposed project area. In order to describe these community conditions, historical and recent demographic, housing, and economic information was obtained from the 2000 and 2010 U.S. Census Bureau, including survey data from the 2006 to 2010 and 2007 to 2011 Census American Community Surveys (ACS)[1] (U.S. Census Bureau 2000, U.S. Census Bureau 2010, U.S. Census Bureau 2011) and also from the 2010 projections of the Association of Bay Area Governments (ABAG 2009).

Environmental consequences on community character were determined through a comparison of community conditions in relation to changes that would occur under the proposed action. Findings from other relevant resource areas (aesthetics and visual quality, historic properties, land use, climate/microclimate/wind, noise, transportation) are reviewed to determine where the action has the potential to change existing character. The effects identified for these resources were considered for their potential to alter the physical shape, character, or function of communities both in the short term (during implementation of the proposed and connected actions) and in the long term (given changes to communities as a result of the proposed and connected actions).

4.10.2.2 Residential Property Values

Information on residential property values was gathered to describe housing stock trends, ownership, and property values for both the region and proposed project area. Historical and recent housing information was obtained from the 2006 to 2010 ACS (U.S. Census Bureau 2010).

4.10.2.3 Induced Growth

Projected population and housing growth in both the region and proposed project area was examined to assess the potential for the proposed action to create induced growth. Historical and recent data on projected population and housing growth were obtained from the 2006 to 2010 ACS and the ABAG (ABAG 2009, U.S. Census Bureau 2010).

4.10.2.4 Executive Order 12898: Environmental Justice

The environmental justice analysis identifies the potential for the proposed action to result in disproportionately high and adverse effects on minority or low-income populations. First, locations of minority populations and low-income populations in the proposed project area were identified using the most recent census tract-level census data. Minority or low-income census tracts are defined as those meeting either of the following criteria:

- The census tract contains 50% or more minority persons or 25% or more low-income persons.

[1] Note that 2006 to 2010 data from the ACS is an average of the 5-year estimates from 2006 through 2010.

- The percentage of minority, including linguistically isolated[2] persons or low-income persons, in any census tract is more than 10% greater than the average of the surrounding county.

Minority persons are defined as all people not identified as White only, plus White-only people identified as Hispanic or Latino. Low-income persons are defined as those individuals with incomes below 1.25 times the census poverty threshold.[3]

4.10.2.5 Proposed Project Area

The proposed project area is described in three geographic levels: the overall region (Alameda and Contra Costa counties), the census tracts containing the proposed and connected project areas, and the census block groups immediately adjacent to project areas. Census tract data are presented to represent general conditions in the proposed project area. The environmental justice analysis contains data at the block group level to better represent the neighborhoods with the potential to experience effects from the proposed and connected actions.[4]

Table 4.10-2 lists the specific census tracts included in this analysis. These census tracts are grouped to represent the community areas potentially affected by the action. Some proposed and connected project areas are not adjacent to any communities and are not associated with any census tracts.

Boundaries and descriptions of the smaller neighborhood areas directly adjacent to the proposed and connected project areas are described in detail in the communities section below.

4.10.3 Population Demographics

This section provides a description of the affected environment in terms of population demographics. Demographics are presented for the region (Alameda and Contra Costa counties) as well as the smaller proposed project area (census tracts).

[2] "A linguistically isolated household is one in which no person age 14 or over speaks English at least very well. That is no person age 14 or over speaks only English at home, or speaks another language at home and speaks English very well. A linguistically isolated person is anyone living in a linguistically isolated household." (U.S. Census Bureau 2010)

[3] The census measure of poverty is representative of conditions in the U.S. as a whole. The income to poverty ratio threshold of 1.25 is used here given the higher cost of living in the Bay Area as compared to other areas of the country.

[4] For example, a community adjacent to existing vegetation that would be affected by the proposed and connected actions would be identified as having the potential for effects if that vegetation currently comprises an important part of the aesthetics or feel of the community. Given the size and location of the proposed and connected project areas, such an area is much smaller than the census tract as a whole.

Table 4.10-2. Census Tracts Associated With the Parks and Open Space Areas in Which the Proposed and Connected Actions Would Occur

Parks and Open Space Areas	Census Tracts
Lake Chabot Regional Park	4304
Anthony Chabot Regional Park–South	4101.02, 4303
Anthony Chabot Regional Park–North and Leona Canyon Regional Open Space Preserve	4081, 4099, 4100
Redwood Regional Park	4046, 4080
Sibley Volcanic Regional Preserve–South and Huckleberry Botanic Regional Preserve	4045.02
Caldecott Tunnel-PDM	N/A
Claremont-PDM, Claremont Canyon Regional Preserve, Sibley Volcanic Regional Preserve–North and North Hills-Skyline-PDM	4001, 4044
Frowning Ridge-PDM, Strawberry Canyon-PDM	4227, 4237, 4226
Tilden Regional Park–North	4216
Wildcat Canyon Regional Park–South	3920, 3851, 3560.02, 3540.01, 4211, 4215
Wildcat Canyon Regional Park–North	3610, 3690.02, 3601.02, 3620
Sobrante Ridge Regional Preserve	3522.02, 3530.01
Miller/Knox Regional Shoreline	3780

N/A = No community adjacent to the project areas

4.10.3.1 Region

Recent changes in population totals differ for the two counties (see Table 4.10-3). Alameda County grew by 4.6% between the years of 2000 to 2010 while Contra Costa County grew by 10.6% from 2000 levels. Projected population estimates to 2020 show that growth over this period is expected to be similar between the two counties, averaging around 12% over the 10-year span.

Table 4.10-3. Population in Region for 2000, 2010, and 2020

	No. Persons		
County	2000[(1)]	2010[(2)]	2020[(3)]
Alameda	1,443,741	1,510,271	1,705,898
Contra Costa	948,816	1,049,025	1,177,397
Total	**2,392,557**	**2,559,296**	**2,883,295**

(1) U.S. Census Bureau 2000
(2) U.S. Census Bureau 2010
(3) ABAG 2009

Alameda County had a higher percentage of minority persons in 2010 than Contra Costa County. In the two-county region, the “minority” population represented more than 60% of the population (See Table 4.10-4).

Table 4.10-4. White Only, Non-Hispanic, and Minority Populations in the Region in 2010

	White Only, Non-Hispanic		Minority	
County	No. Persons	%	No. Persons	%
Alameda	514,559	34.1	995,712	65.9
Contra Costa	500,923	47.8	548,102	52.2
Total/Average	**1,015,482**	**39.7**	**1,543,814**	**60.3**

Source: U.S. Census Bureau 2010

Other important socioeconomic characteristics of the population include age distribution and household types in the region. Age group breakdown is similar between the two counties (see Table 4.10-5). In 2010, about 25% of the population was between ages 0 to 19, 64% was between ages 18 to 64 and 11% was over 65 years old in Alameda County while 27% of the population was between ages 0 and 19, 60% of the population was between the ages of 20 and 65, and 12% of the population was over 65 in Contra Costa County. Alameda County had a lower percentage of married households, 47%, as compared to 53% in Contra Costa County, and a higher percentage of non-family households, 35% as compared to 29% in Contra Costa County (U.S. Census Bureau 2010).

Table 4.10-5. Age Breakdown

County	Population	0 – 19	20 – 65	65 +
Alameda	1,510,271	25%	64%	11%
Contra Costa	1,049,025	27%	60%	12%
Total	**2,559,293**	**26%**	**62%**	**12%**

Source: U.S. Census Bureau 2010

4.10.3.2 Proposed Project Area

Between 2006 and 2010, the census tracts containing the proposed project area had growth rates slower than that of Alameda and Contra Costa counties. In several cases, the populations for census tracts actually decreased. This trend is expected to continue between 2010 and 2020, with all census tracts expected to grow at a rate slower than the overall growth rate of the counties (ABAG 2009, U.S. Census Bureau 2010).

Census tracts in the proposed project area generally have a smaller percentage of minority population than the region as a whole. For Alameda County only, census tracts 4100 (91.9%) and 4226 (77.7%) had higher minority rates than the county rate of 74.8%). In Contra Costa County, census tracts 3690.02 (76.6%), 3601.02 (60.3%), and 3560.02 (61.9%) had higher minority rates than the county-wide average of 59.8% (see Table 4.10-6) (U.S. Census Bureau 2011). A more detailed breakdown of racial and ethnic characteristics in the proposed project area is provided in Section 4.10.7.

None of the census tracts are significantly different in age distribution from each other or from the counties as a whole.

In regard to household type, there were several exceptions in both counties. Census tract 4226 and 4227 had extremely low percentages of married households, between 2 and 10%, respectively. The majority of the population in these two census tracts is associated with student housing. In Contra Costa County, census tracts 3610 and 3690.02 had lower percentages of married households (between 44 and 41%, respectively) and a higher percentage of non-family households (between 47 and 37%, respectively) than the countywide average (U.S. Census Bureau 2010).

Table 4.10-6. Minority Breakdown

County	Census Tract	Total Census Tract Population	Minority No. Persons	Minority %
Alameda	4001	2,451	558	22.8%
	4044	5,255	1,825	34.7%
	4045.02	5,915	1,481	25.0%
	4046	4,449	1,147	25.8%
	4080	2,622	1,191	45.4%
	4081	5,767	3,539	61.4%
	4099	3,231	2,340	72.4%
	4100	2,857	2,626	91.9%
	4211	2,192	434	19.8%
	4215	3,810	804	21.1%
	4216	3,541	844	23.8%
	4226	1,128	877	77.7%
	4227	4,101	2,316	56.5%
	4237	3,562	1,177	33.0%
	4301.02	2,194	803	36.6%
	4303	3,764	1,523	40.5%
	4304	2,048	807	39.4%
	County Total	**1,494,876**	**1,117,425**	**74.8%**
Contra Costa	3522.02	2,305	601	26.1%
	3530.01	3,597	834	23.2%
	3540.01	1,660	327	19.7%
	3560.02	5,513	3,412	61.9%
	3601.02	4,415	2,664	60.3%
	3610	4,576	2,680	58.6%
	3620	2,668	1,075	40.3%
	3690.02	2,756	2,110	76.6%
	3780	3,093	1,161	37.5%
	3851	2,470	1,016	41.1%
	3920	2,455	697	28.4%
	County Total	**1,037,817**	**620,493**	**59.8%**

Source: U.S. Census Bureau 2011

4.10.4 Housing Characteristics

This section provides a description of housing characteristics. These characteristics are presented for the region (Alameda and Contra Costa counties) as well as the smaller proposed project area (census tracts).

4.10.4.1 Region

The housing in Alameda and Contra Costa counties is composed almost entirely of single- and multi-family structures. Between 2000 and 2010, there was a large growth experienced of single-family and multi-family dwellings in Contra Costa County, with a decrease in multi-family residences. The composition of housing stock remained relatively consistent for Alameda County (See Table 4.10-7).

Table 4.10-7. Composition of Housing Stock in Region in 2000 and 2010

	Single-Family Residences		Multi-Family Residences		Mobile Home/Boat	
County	2000[1]	2010[2]	2000[1]	2010[2]	2000[1]	2010[2]
Alameda	60%	60%	38%	38%	1%	1%
Contra Costa	67%	74%	30%	23%	2%	2%

[1] U.S. Census Bureau 2000
[2] U.S. Census Bureau 2010

Important housing characteristics identifying the character of a community are home ownership and the amount of time residents have been in a home – often referred to as resident tenure. In 2010, Contra Costa County had a much higher percentage of households owning their residences (69%) as compared to Alameda County (55%) (U.S. Census Bureau 2010).

Both counties had a very similar breakdown of resident tenure, with about 84% of households having moved into their current residence within the last 10 years (U.S. Census Bureau 2010). Residential property values increased significantly between 2000 and 2010 (see Table 4.10-8).

4.10.4.2 Proposed Project Area

The housing stock percentages in the proposed project area generally show higher numbers of single-family residences and much lower numbers of multi-family residences compared to the rest of the region. The exceptions are census tracts 4227 and 4237 in Alameda County, which are predominately composed of multi-family residences, between 82 and 58%, respectively. These high numbers are attributable to student housing within these tracts. Census tracts 3610 and 3601.02 in Contra Costa County showed the highest percentage of multi-family housing in Contra Costa County, between 40 and 38%, respectively. Census tracts 4303, 4304, 3610, and 3690.02 had slightly high percentages of boat and mobile homes (U.S. Census Bureau 2000, U.S Census Bureau 2010).

There is a much higher rate of home ownership in the Alameda County portion of the proposed project area than in the two-county region as a whole. On average, 76.5% of residents own their homes in the census tracts in and adjacent to the proposed and connected project areas in Alameda County. Census Tracts 4226 and 4227 have smaller percentages of home ownership (between 66 and 9%) compared to the overall region. In Contra Costa County, census tract 3690.02 represents the tract with the lowest home-ownership rate at 58.4%. Census tracts in the proposed project area also generally have a higher rate of residential tenure in 2010 compared to the counties. This shows an established population that has lived in the area for a long time (U.S. Census Bureau 2010).

Table 4.10-8. Number of Residential Units in Alameda and Contra Costa Counties by Property Value in 2000 and 2010

	Number of Residential Units by Property Value and Year									
	Less than $200,000		$200,000 to $499,999		$500,000 to $999,999		$1,000,000 or More		Median Value	
County	2000[1]	2010[2]	2000[1]	2010[2]	2000[1]	2010[2]	2000[1]	2010[2]	2000[1]	2010[2]
Alameda	50,745/20%	18,023/6%	164,065/65%	89,247/30%	31,914/13%	158,153/54%	4,449/2%	27,854/9%	$303,100	$590,900
Contra Costa	64,574/31%	23,883/9%	108,444/52%	90,523/35%	32,742/16%	108,553/42%	4,583/2%	32,857/13%	$267,800	$548,200
Total	**115,319/25%**	**41,903/8%**	**272,509/42%**	**179,770/33%**	**64,656/10%**	**266,706/48%**	**9,032/2%**	**60,711/11%**	—[3]	—[3]

(1) U.S. Census Bureau 2000
(2) U.S. Census Bureau 2010
(3) U.S. Census Bureau 2000 and ACS Survey data do not provide a median property value for the two-county region as a whole

As in the counties, housing values have increased significantly since 2000 for most census tracts in the proposed project area. Median property values in 2010 are higher in all census tracts in the proposed project area, with the exception of census tracts 3610, 3690.02, and 3620 (U.S. Census Bureau 2010).

Current land use acreage data show that housing development in most of these census tracts has been stable over the last decade and is projected to continue with little to no growth in housing development. This fact illustrates the built-out nature of these areas and the trend toward smaller in-fill development rather than new expansive development (ABAG 2009).

4.10.5 Economic Conditions

This section provides a description of economic conditions related to income and employment levels. The economic setting is presented for the region (Alameda and Contra Costa counties) as well as the smaller proposed project areas (census tracts).

4.10.5.1 Region

Contra Costa County had a slightly higher median household income in 2010 ($73,721) than Alameda County ($67,169). Differences between the counties occur at the extremes with Contra Costa having a lower percentage of persons in the less than $50,000 range and a higher percentage in the greater than $200,000 range (see Table 4.10-9).

Table 4.10-9. Income in the Region in 2010

County	Less Than $50,000	$50,000 to $99,999	$100,000 to $199,999	$200,000+	Median ($)
Alameda	38%	29%	25%	8%	$67,169
Contra Costa	26%	30%	31%	13%	$73,721
Total	**32%**	**30%**	**28%**	**10%**	**(1)**

Source: U.S. Census Bureau 2010

(1) U.S. Census ACS data do not provide a median income for the two-county region as a whole.

The unemployment rate averaged 8% in Alameda County and 12% in Contra Costa County from 2006 through 2010 (U.S. Census Bureau 2010).

4.10.5.2 Proposed Project Area

In 2010, the median income for all census tracts in the proposed project area was generally higher than in the larger county areas. The exceptions are census tracts 4226 ($6,125) and 4227 ($34,125). The low median income reported in these two census tracts is due to the large numbers of persons living in student housing and enrolled as full-time students. In Contra Costa County, census tract 3610 has a median income of $63,977, census tract 3690.02 has a median income of $63,611, and census tract 3780 has a median income of $72,708. These are the only three census tracts with a median income below the county median of $73,721.

Average unemployment for 2006 through 2010 in all of the communities was similar to or below the county averages (U.S. Census Bureau 2010).

4.10.6 Communities

The community areas expected to be affected by the project activities are small in comparison to the census tracts described in the data above. Potential effects from the action are expected to be limited to one or two streets in the communities adjacent to the park and open space areas. Therefore, while the census tract data are useful in generating an overall picture of the characteristics of the communities, the actual boundaries of the affected areas are much smaller. These adjacent community areas are described in more detail below.

4.10.6.1 Region

The communities identified in the proposed project area are all in Alameda County and Contra Costa County.

4.10.6.2 Proposed Project Area

This section provides a brief description of the communities adjacent to the proposed and connected project areas. Overall, these communities are composed of single-family residential housing bordering park and open space areas. Given the proximity of these neighborhoods to these parks and open spaces, community character is very much defined by access to these resources. No significant commercial areas were identified in these areas. Key community facilities are highlighted in each community description where relevant.

4.10.6.2.1 Lake Chabot Regional Park

Residences bordering the parklands adjacent to the proposed and connected project areas are along Arcadian Drive, Arcadian Court, Mayflower Drive, September Court, Brierly Court, and Hillsborough Drive. Structures in this area are primarily single-family residences overlooking parklands. There are many park trail access points along these streets, highlighting the interconnectedness of the neighborhoods with the park facilities.

4.10.6.2.2 Anthony Chabot Regional Park–South

There are no adjacent communities because the proposed and connected project areas are entirely surrounded by parkland. Recreational facilities adjacent to the project areas include the Chabot Gun Club shooting range and the EBRPD’s Lake Chabot Campground Area.

4.10.6.2.3 Anthony Chabot Regional Park-North and Leona Canyon Regional Open Space Preserve

Residences bordering the parklands adjacent to the proposed and connected project areas are along Skyline Boulevard, Knoll Ridge Way, Clairepointe Way, Lexford Place, Graham Place, Saddle Brook Drive, Brookpark Drive, Tartan Way, Bell Waver Way, Balmoral Drive, and Blythen Way. Structures in this area are primarily single-family residences overlooking parklands. Skyline High School, the City of Oakland Horse Stables, and the EBRPD’s Chabot Equestrian Center are key community facilities along Skyline Boulevard adjacent to project areas. Proposed project area AC002 overlooks the intersection of Skyline Boulevard and Redwood Road, home to Sunrise of Oakland, a senior assisted living facility; Oakland Hebrew Day School; and several commercial enterprises.

4.10.6.2.4 Redwood Regional Park

Residences bordering proposed and connected project areas in Redwood Regional Park are along Skyline Boulevard, Wilton Drive, and Shirley Drive. Structures in this area are primarily single-family residences overlooking parklands. Key community facilities adjacent to project areas include the Chabot Space and Science Center as well as Skyline Gate, Moon Gate, Redwood Bowl, and Roberts Regional Recreation Area – popular trailhead facilities and access points for the regional park – thus highlighting the interconnectedness of these neighborhoods with the park facilities.

4.10.6.2.5 Sibley Volcanic Regional Preserve–South and Huckleberry Botanic Regional Preserve

Residences bordering the parklands adjacent to proposed and connected project areas are along Manzanita Drive, Villanova Drive, Everton Drive, Skyline Boulevard, and Grizzly Peak Boulevard. Structures in this area are primarily single-family residences overlooking parklands. Key park facilities and park access points in this area – Huckleberry Botanic Regional Preserve and Sibley Volcanic Regional Preserve – again demonstrate the importance of the parks to community character.

4.10.6.2.6 Claremont-PDM, Claremont Canyon Regional Preserve, Sibley Volcanic Regional Preserve–North and North Hills-Skyline-PDM

Residences bordering the parklands adjacent to the proposed and connected project areas are along Grizzly Peak Boulevard, Grizzly Terrace Drive, Tunnel Road, Bay Forest Drive, Buckingham Boulevard, Strathmoor Drive, Westmoreland Drive, Stonewall Road, and Claremont Avenue. Structures in this area are primarily single-family residences overlooking parklands. Again, the community and park interface is apparent with numerous park entrances and trailheads, particularly the heavily accessed entrance to the Claremont Canyon Regional Preserve on Stonewall Road. Portions of the project areas along Claremont Avenue are remote from all communities. However, given the elevation of these areas, they can be seen from the highly commercial area surrounding the Claremont Resort Hotel at the base of Claremont Canyon.

4.10.6.2.7 Caldecott Tunnel-PDM

The proposed Caldecott Tunnel-PDM project area is in the City of Oakland (Oakland) on the east side of State Route 24 immediately southwest of the Caldecott Tunnel. The Caldecott Tunnel-PDM project area includes most of the North Oakland Regional Sports Center, which contains the Caldecott Ballfields. Single-family residential areas are south and east of Caldecott Tunnel-PDM along Skyline Boulevard, Broadway Terrace, Gwin Road, Fairlane Drive, Swainland Road, and Pali Court.

4.10.6.2.8 Frowning Ridge-PDM, Strawberry Canyon-PDM

Strawberry Canyon-PDM and Frowning Ridge-PDM are in the UCB Hill Campus in Oakland, east of the more developed portions of the UCB campus. Strawberry Canyon-PDM includes UCB buildings and is adjacent to Lawrence Berkeley National Laboratory to the west and a residential neighborhood in Berkeley to the northwest. Frowning Ridge-PDM, east of Strawberry

Canyon-PDM, is undeveloped but is adjacent to a sparsely developed section of the UCB campus to the southwest.

4.10.6.2.9 Tilden Regional Park

Residences bordering parklands to the west of the proposed and connected project areas are along Summit Road and Ajax Place. Structures in this area are primarily single-family residences overlooking parklands. The EBRPD's Tilden Regional Park Golf Course is east of the project areas.

4.10.6.2.10 Wildcat Canyon Regional Park–South

Residences bordering the parklands adjacent to the proposed and connected project areas are along Plateau Drive, Beloit Avenue, Los Altos Drive, Kenyon Avenue, Lake Drive, Purdue Avenue, Kensington Court, Leneve Place, Ivory Court, Thor's Bay Road, Bell View Court, Wildcat Drive, and Rifle Range Road. Structures in this area are primarily single-family residences overlooking parklands. Kensington Elementary School is adjacent to proposed project area WC011. Key community park access points in this area include the Rifle Range trailhead to EBRPD's Wildcat Canyon Regional Park.

4.10.6.2.11 Wildcat Canyon Regional Park–North

Residences bordering the proposed and connected project areas are along Harbor View Drive, Capitol Hill Avenue, and Monte Cresta Avenue. Additional areas include the Hansford Heights area, east of Bonita Road. Structures in this area are primarily single-family residences overlooking parklands with trail access to EBRPD's Wildcat Canyon Regional Park.

4.10.6.2.12 Sobrante Ridge Regional Preserve

Residences adjacent to the proposed project area are along Crow's Nest Way, Rain Cloud Drive, Solitude Lane, and Silver Belt Drive. Structures in this area are primarily single-family residences close to parklands with trail access points to the EBRPD's Sobrante Ridge Regional Preserve.

4.10.6.2.13 Miller/Knox Regional Shoreline

Residences close to proposed project areas are along Crest Avenue, Belvedere Avenue, and Quarry Court. Structures along Crest Avenue and Belvedere Avenue are primarily single-family residences overlooking parklands with trail access points to EBRPD's Miller/Knox Regional Shoreline. Residences along Quarry Court are primarily multi-family in nature.

4.10.7 Environmental Justice Communties

This section provides a description of the affected environment in terms of low-income and minority persons. Data on low-income and minority populations are presented for the region (Alameda and Contra Costa counties) as well as the smaller proposed project area (selected block groups).

4.10.7.1 Region

Poverty rates in the two counties are similar. The percentage of individuals with incomes less than 1.25 times the poverty level is 15.3% in Alameda County and 13.1% in Contra Costa County (U.S. Census Bureau 2011).

Hispanics and Asians represented the largest minority groups in the two-county region in 2011. In Alameda County, Asians were the largest minority group where they represented approximately 26% of the total population, with Hispanics making up 22% and African Americans 13%. In Contra Costa County, Hispanics represented approximately 24% of the population, with Asians making up 14% and African Americans 9% (see Table 4.10-10).

Table 4.10-10. Primary Ethnic and Racial Groups in the Region in 2010

	Hispanic		Asian		African American	
County	No. Persons	% Total Population	No. Persons	% Total Population	No. Persons	% Total Population
Alameda	332,103	22.2%	391,627	26.2%	186,326	12.5%
Contra Costa	248,089	23.9%	147,948	14.3%	94,782	9.1%
Total	**580,192**	**22.9%**	**539,575**	**21.3%**	**281,108**	**11.1%**

Source: U.S. Census Bureau 2011

4.10.7.2 Proposed Project Area

In the census tracts in and adjacent to the proposed and connected project areas, percentages of people with incomes less than 1.25 times the poverty level are generally similar to or lower than the county percentages in 1999 (U.S. Census Bureau 2000). Census tract data are shown in Table 4.10-11.

Based on the environmental justice criteria presented in the methodology section above, the following census tract adjacent to proposed and connected project areas represents a low-income community:

- Alameda County census tract 4227, (29.2% of the population under 1.25 times the poverty level)

This census tract includes parts of the UCB campus, and most of the residents of this tract are UCB students. In census tract 4227, 1,509 or 37% of the 4,101 residents live in households described by the census as “group quarters,” which in this case captures student housing units at UCB. It is also likely that many of the residents not living in student housing in this census tract are also students, given that 82% of the 1,063 non-institutional student housing units are renter occupied, and 68% of these 1,063 housing units have been occupied by the current residents for less than 5 years. Students generally have low incomes, but student communities are not the type of community the environmental justice executive order was designed to protect.

In the census tracts in and adjacent to the proposed and connected project areas, total minority percentages are generally similar to or lower than the county percentages (U.S. Census Bureau 2011). These data are shown in Table 4.10-11.

Based on the environmental justice criteria presented in the methodology section above, the following census tracts represent minority environmental justice communities:

Alameda County

- Census tract 4081 (61.4%)
- Census tract 4099 (72.4%)
- Census tract 4100 (91.9%)
- Census tract 4226 (77.7%)
- Census tract 4227 (56.5%)

Contra Costa County

- Census tract 3560.02 (61.9%)
- Census tract 3601.02 (60.3%)
- Census tract 3610 (58.6%)
- Census tract 3690.02 (76.6%)

The corresponding county percentages are 74.8% in Alameda County and 59.8% in Contra Costa County.

In the census tracts in and adjacent to the proposed and connected project areas, percentages of linguistically isolated households are generally similar to or lower than the county percentages in 2011 (U.S. Census Bureau 2011). Census tract data are shown in Table 4.10-12.

Based on the environmental justice criteria presented in the methodology section above, none of the census tracts in and adjacent to the proposed and connected project areas would represent linguistically isolated environmental justice communities.

Additionally analysis was completed of all of the census tracts within Alameda and Contra Costa counties to identify tracts with linguistic isolation more than 10% greater than the average of the surrounding county. Of the census tracts identified, three tracts (3690.01, 3672, and 3720) were located within 1 mile of the proposed and connected project areas.

Table 4.10-11. Minority and Low-Income Populations Adjacent to the Proposed and Connected Project Areas

Census Tract	Total Population	White Only	Black Only	Asian Only	Other and Mixed	Hispanic or Latino	Total Minority		Below 1.25 Times the Poverty Level
Alameda County									
4001	2451	1962	124	228	121	85	558	22.8%	4.5%
4044	5255	3746	173	740	596	316	1825	34.7%	6.7%
4045.02	5915	4744	116	597	458	310	1481	25.0%	4.3%
4046	4449	3408	399	428	205	115	1147	25.8%	2.1%
4080	2622	1657	94	564	307	226	1191	45.4%	8.2%
4081	5767	2746	1819	809	393	518	3539	61.4%	6.9%
4099	3231	1097	1811	204	119	206	2340	72.4%	7.0%
4100	2857	868	1121	195	648	662	2626	91.9%	10.0%
4211	2192	1785	17	265	78	74	434	19.8%	12.5%
4215	3810	3166	69	337	222	176	804	21.1%	4.3%
4216	3541	2816	80	456	183	125	844	23.8%	9.2%
4226	1128	423	10	531	153	183	877	77.7%	2.0%
4227	4101	2123	163	1501	299	353	2316	56.5%	29.2%
4237	3562	2663	36	707	156	278	1177	33.0%	19.1%
4301.02	2194	1588	121	399	76	207	803	36.6%	4.1%
4303	3764	2548	475	513	185	350	1523	40.5%	5.8%
4304	2048	1530	64	208	233	302	807	39.4%	0.9%
Contra Costa County									
3522.02	2305	1783	63	403	36	99	601	26.1%	11.8%
3530.01	3597	2866	186	353	192	103	834	23.2%	3.3%
3540.01	1660	1333	56	177	94	0	327	19.7%	1.6%
3560.02	5513	2515	913	1248	585	666	3412	61.9%	6.2%
3601.02	4415	2388	524	1155	348	637	2664	60.3%	10.4%
3610	4576	2628	600	932	329	819	2680	58.6%	15.5%
3620	2668	1821	418	263	145	249	1075	40.3%	8.8%
3690.02	2756	1153	658	453	492	507	2110	76.6%	16.8%
3780	3093	2494	283	193	123	562	1161	37.5%	16.0%
3851	2470	1760	103	502	105	306	1016	41.1%	1.1%
3920	2455	1862	19	326	248	104	697	28.4%	3.6%

Source: U.S. Census Bureau 2011

Table 4.10-12. Linguistic Isolation in Census Tracts Associated With the Proposed and Connected Project Areas in 2010

County	Census Tract	Population
Alameda County	4001	0.9%
	4044	0.4%
	4045.02	1.3%
	4046	1.1%
	4080	1.2%
	4081	3.0%
	4099	1.5%
	4100	5.7%
	4211	1.1%
	4215	0.8%
	4216	3.2%
	4226	0.0%
	4227	2.1%
	4237	7.4%
	4301	3.6%
	4303	0.6%
	4304	0.9%
	County Average	**10.1%**
Contra Costa County	3522.02	1.4%
	3530.01	1.8%
	3540.01	1.4%
	3560.02	2.2%
	3601	4.9%
	3610	3.0%
	3620	1.1%
	3690.02	3.4%
	3780	2.0%
	3851	8.2%
	3920	0.0%
	County Average	**7.2%**

Source: U.S. Census Bureau 2011

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4.11 Human Health and Safety

This section includes a discussion of the current activities conducted by the subapplicants under their respective vegetation management plans, specifically the use of pesticides and petroleum products in the subapplicants' programs and activities in and near the proposed and connected project areas.

The proposed and connected actions would include use of herbicides. Herbicides are regulated as pesticides, which also include insecticides, rodenticides, fungicides, and bactericides. Because herbicides are regulated as pesticides and must meet the regulatory requirements for pesticides, this section of the EIS refers primarily to pesticides rather than herbicides. However, only herbicides would be used in the proposed and connected actions and the alternatives.

4.11.1 Regulatory Setting

The use, storage, and disposal of hazardous materials, including pesticides, are regulated by numerous laws and regulations under local, state, and federal jurisdictions. EPA is the federal agency that administers hazardous materials and hazardous waste regulations, including pesticide regulations. Responsible state agencies include the California Environmental Protection Agency (Cal/EPA), which includes the California Department of Toxic Substances Control (DTSC), the State Water Resources Control Board (SWRCB), the California Department of Pesticide Regulation (CDPR), and other departments. The San Francisco Regional Water Quality Control Board (SFRWQCB), Alameda County Department of Environmental Health, and Contra Costa County Health Services Department have jurisdiction on a regional or local level. Also on the local level, the cities of Berkeley and Oakland have policies regarding pesticide usage within their jurisdictions.

The federal regulations are primarily codified in 40 CFR. The legislation is outlined in the Resource Conservation and Recovery Act of 1976 (RCRA), the Superfund Amendments and Reauthorization Act of 1986, and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). EPA is responsible for enforcement and implementation of federal laws and regulations pertaining to hazardous materials.

In the State of California, Cal/EPA is responsible for the regulation of hazardous substances, including pesticides under CERCLA and the California Health and Safety Code. Under Cal/EPA, several regulatory agencies are delegated to implement state regulations related to hazardous substances including DTSC, the SWRCB, and the CDPR.

The DTSC was established to protect California against threats to public health and degradation of its environment by regulating hazardous waste, cleaning up existing contamination, and preventing pollution by working with businesses to reduce their hazardous waste and toxic materials use.

The SWRCB protects water quality by setting statewide policy, coordinating and supporting the efforts of regional water boards, and reviewing petitions that contest regional water board actions. The SWRCB is also solely responsible for allocating surface water rights. The SWRCB works in coordination with the regional water boards to preserve, protect, enhance, and restore water quality. Major areas of focus include storm water, wastewater treatment, water quality

monitoring, wetlands protection, ocean protection, environmental education, environmental justice, and cleanup of contaminated sites, including brownfields and low-impact development.

CDPR monitors the use of pesticides from farm fields to the grocery shelf to assure the safety of workers and the public. Its regulatory activities are conducted by the seven branches of its Pesticide Program Division: Pesticide Registration, Medical Toxicology, Worker Health and Safety, Pesticide Enforcement, Environmental Monitoring, Product Compliance, and Pest Management and Licensing (see Section 4.11.1.4 for further discussion of pesticide regulations.)

The following subsections provide the federal, state, and local regulations that pertain to the use of hazardous substances, including pesticides.

4.11.1.1 Federal

NEPA requires the consideration of potential environmental impacts, including potential hazardous wastes and materials impacts, in the evaluation of any proposed federal agency action. NEPA also obligates federal agencies to consider the environmental consequences and costs of their projects and programs as part of the planning process. General NEPA procedures are set forth in the Council on Environmental Quality regulations (44 CFR Part 10).

The following additional federal codes and regulations pertain to hazardous substances, including pesticides:

Resource Conservation and Recovery Act (RCRA) (42 U.S.C. §§ 6901 et seq.) regulates the identification, generation, transportation, storage, treatment, and disposal of solid and hazardous materials and hazardous wastes.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 U.S.C. § 9601 et seq.) regulates former and newly discovered uncontrolled waste disposal and spill sites and established the National Priorities List for contaminated sites and the "Superfund" cleanup program.

Clean Air Act (42 U.S.C. § 7400 et seq.) regulates airborne contaminants to limit the general public's exposure to those contaminants that are known to be hazardous to human health. Under the Clean Air Act, EPA established National Emissions Standards for Hazardous Air Pollutants, which are emissions standards for air pollutants, including pesticides.

Clean Water Act (CWA) (33 U.S.C. § 1251 et seq.) regulates discharges and spills of pollutants, including hazardous materials, to surface waters and groundwater. The CWA provides an integrated approach to protecting aquatic ecosystems and human health by regulating potentially toxic discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) permit and by regulating ambient water quality through numeric criteria and narrative ('beneficial use') water quality standards defined in the California Toxics Rule (*Federal Register* 65: No 97, 2000). In California, the SWRCB, through the local Regional Water Quality Control Boards, administers the program and issues the NPDES permits. According to the Sixth Circuit Court, the application of pesticides at, near, or over waters of the United States that results in discharges of pollutants requires coverage under a NPDES permit

(SWRCB 2011). The State of California has adopted four general NPDES pesticide discharge permits.

Safe Drinking Water Act (42 U.S.C. § 300(f) et seq.) regulates discharges of pollutants to underground aquifers, authorizes EPA to establish minimum standards to protect tap water, and requires all owners or operators of public water systems to comply with these primary (health-related) standards. Under the act, EPA also establishes minimum standards for state programs to protect underground sources of drinking water from endangerment by underground injection of fluids (Cal/EPA 2011b, EPA 2011c).

Toxic Substances Control Act of 1976 (15 U.S.C. § 2601 et seq.) regulates the manufacturing, inventory, and disposition of industrial chemicals, including hazardous materials, except pesticides.

Occupational Safety and Health Act (29 U.S.C. § 661 et seq.) regulates worker safety in the construction industry under 29 CFR Part 1926, including construction safety and health standards. Under the Occupational Safety and Health Administration (OSHA), these standards limit the amount of hazardous chemicals workers can be exposed to, require the use of certain safe practices and equipment, and require employers to monitor hazards and keep records of workplace injuries and illnesses. Examples of OSHA standards include requirements to provide fall protection; prevent trenching cave ins; prevent some infectious diseases; assure that workers safely enter confined spaces; prevent exposure to harmful substances like dusts, fumes, and vapors; put guards on machines; provide respirators or other safety equipment; and provide training for certain dangerous jobs.

Employers must also comply with the General Duty Clause of the act, which requires employers to keep their workplace free of serious recognized hazards. This clause is generally cited when no OSHA standard applies to the hazard.

The California Division of Occupational Safety and Health (Cal/OSHA) regulates, under an agreement with Cal/OSHA, an occupational safety and health program in accordance with Section 18 of the act. Cal/OSHA adopted the federal OSHA regulations and additional more stringent modifications to the federal regulations under Title 8 of the California Code of Regulations (CCR). See Section 4.11.1.2 for additional information regarding Cal/OSHA regulations related to pesticides.

Pesticide Registration Improvement Act (PRIA) of 2003 and PRIA Renewal Act (PRIA2) establishes pesticide registration service fees for registration actions in three pesticide program divisions: Antimicrobials, Biopesticides and Pollution Prevention, and the Registration Divisions.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. § 136 et seq. and 40 CFR Parts 152 to 171) regulates the manufacturing, distribution, sale, and use of pesticides. FIFRA requires that pesticides be registered (licensed) by EPA before they may be sold or distributed for use in the United States and that they perform their intended functions without causing unreasonable adverse effects on people and the environment when used according to EPA-approved label directions.

EPA requires extensive scientific research and supporting test data as part of its pesticide review and approval process before granting a registration for most pesticides. These studies allow EPA to assess risks to human health, domestic animals, wildlife, plants, groundwater, and beneficial insects and to assess the potential for other environmental effects. When new evidence raises questions about the safety of a registered pesticide, EPA may take action to suspend or cancel its registration and revoke the associated residue tolerance. EPA may also undertake extensive special review of a pesticide's risks and benefits or work with manufacturers and users to implement changes in a pesticide's use (e.g., reducing application rates, cancellation of a pesticide's use).

Special uses of pesticides, outside their original label specifications, can be considered on a case-by-case basis through FIFRA Section 24C (EPA 1996). Under the reregistration program, EPA is systematically reviewing all pesticides registered before November 1984 to ensure that they meet current testing and safety standards.

Federal Food, Drug, and Cosmetic Act (FFDCA) authorized EPA to set tolerances, or maximum legal limits, for pesticide residues in food. Thus, the FFDCA does not expressly regulate pesticide use, but residue limits established by this agency may result in a change in the use pattern regulated under FIFRA. Herbicide residues in food have been established.

Food Quality Protection Act of 1996 (FQPA) amended FIFRA and FFDCA, setting tougher safety standards for new and old pesticides and making uniform requirements regarding processed and unprocessed foods. The centerpiece of FQPA was the requirement to complete within a decade the massive review and reassessment of the tolerances (maximum permitted residues) for all food use pesticides. EPA's risk assessment process also changed to consider additive effects of pesticide exposure from multiple sources (e.g., drinking water, residential, and dietary) and cumulative effects of pesticides that share common mechanisms of toxicity.

Hazardous Materials Transportation Act (49 U.S.C. §§ 1801–1819 and 49 CFR Parts 101, 106, 107, and 171–180) regulates the transport of hazardous materials by motor vehicles, marine vessels, and aircraft.

Emergency Planning and Community Right to Know Act (40 CFR Parts 350 to 372) regulates facilities that use hazardous materials in quantities that require reporting to emergency response officials.

Executive Order 12088—Federal Compliance with Pollution Control requires federal agencies to take necessary actions to prevent, control, and abate environmental pollution from federal facilities and activities that federal agencies control.

Executive Order 13045--Protection of Children from Environmental Health Risks and Safety Risks requires that each federal agency identify and assess environmental health risks and safety risks that may disproportionately affect children, and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

4.11.1.2 State

The following state laws and regulations pertain to the use of hazardous substances, including pesticides.

Porter-Cologne Water Quality Act (California Water Code Section 13000 et seq.), regulates water quality through the SWRCB and RWQCBs, including oversight of water monitoring and contamination cleanup and abatement. The RWQCBs are responsible for protecting the quality of the waters of the state for present and future beneficial uses. Alameda and Contra Costa Counties fall in the jurisdiction of the SFRWQCB. The SFRWQCB established beneficial uses for protection of surface water and groundwater in its basin plan (SFRWQCB 2010). Risk-based numeric criteria specify the concentrations of some constituents that are protective of aquatic life and other beneficial uses, such as 'drinking water supply,' as is recognized for several creeks in and near the proposed and connected project areas. Under the nondegradation policy adopted by the SWRCB policy (Resolution 68-16), whenever the existing quality of water exceeds the quality necessary to maintain present and potential beneficial uses of the water, existing water quality must be maintained. This policy pertains to both surface waters and groundwater of the state.

California Health and Safety Code, in conjunction with the Federal Resource Conservation Act of 1976, authorized DTSC to regulate hazardous waste in California. Other laws that affect hazardous waste are specific to handling, storage, transportation, disposal, treatment, reduction, cleanup, and emergency planning and include Title 27 of the CCR among other codes and regulations, including but not limited to the following statutes and regulations:

Hazardous Materials Release Response Plans and Inventory Law (California Health and Safety Code Section 25500 et seq.), requires facilities using hazardous materials to prepare hazardous materials business plans and submit them to certified unified program agencies (CUPAs) or other local administering agencies.

Hazardous Waste Control Act (California Health and Safety Code Section 25100 et seq.) is similar to the RCRA on the federal level and regulates the identification, generation, transportation, storage, and disposal of materials the State of California has deemed hazardous.

Safe Drinking Water and Toxic Enforcement Act (Proposition 65) is similar to the Safe Drinking Water Act and Clean Water Act on the federal level and regulates the discharge of contaminants to groundwater. The regulation lists an allowable daily amount (presented in micrograms per day) that may be contacted for each listed chemical (Cal/EPA 2005). For carcinogens, the allowable amounts listed are based on the assumption that daily exposure to the compound occurs over a 70-year lifetime.

California Government Code Section 65962.5 requires the DTSC to compile and maintain lists of potentially contaminated sites throughout the State of California. The referenced section includes the Hazardous Waste and Substances Sites (Cortese) list.

California-Specific Human Health Protective Standards evaluate the potential for adverse effects based on media exposure concentrations. These standards include but are not limited to:

- Maximum contaminant levels (MCLs) are drinking water standards adopted by the California Department of Public Health (CDPH), which are the maximum allowable concentration of a contaminant in drinking water.
- California drinking water notification levels (formerly called "action levels") for chemicals that do not have drinking water MCLs. Notification levels are based mainly on health effects—an incremental cancer risk estimate of 10^{-6} for carcinogens and a threshold toxicity limit for other constituents.
- Response levels are normally set five to ten times higher than their respective notification levels. If a chemical exceeds its response level, CDPH recommends that the drinking water source be taken out of service (advisory only).
- California human health screening levels (CHHSLs) are guidance values developed by Cal/EPA that identify health protective concentrations of 60 chemicals in soil gas, indoor air, and soil.
- Public health goals (PHGs) identify health protective concentrations of chemicals in drinking water. MCLs must be set as close to the PHGs as feasible.
- Water quality objectives are numeric limitations or levels (e.g., concentrations or narrative statements that are established to protect the beneficial uses of a water body). Water quality objectives may be found in water quality control plans (basin plans) adopted by regional water quality control boards.
- As mandated by Proposition 65, chemicals known by the state to cause cancer or reproductive toxicity have been identified. "Safe harbor" levels have been established for many of these chemicals.
- The Air Toxics Hot Spots Program identifies guidelines for the development of acceptable concentrations of chemicals in air.

These regulatory guidance values are designed to be protective of the general public for long-term continuous exposures. In general, they address concentrations in environmental exposure media that may be contacted every day for a lifetime, which is termed a chronic (long-term) exposure period. These values are based on toxicity criteria established by government regulatory agencies (e.g., EPA and Cal/EPA) that include an uncertainty factor to be protective of sensitive subpopulations in addition to the healthy workers addressed by Cal/OSHA standards as described above. Sensitive subpopulations include children, the elderly, and those that may be health compromised. See Appendix F (Technical Appendix for Screening Level Human Health and Ecological Risk Assessments) for more details on the environmental fate of the pesticide components.

4.11.1.3 Local Jurisdiction Plans and Policies

Senate Bill 1082, passed in 1993, created the Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program). The Unified Program (Cal/EPA 2009) consolidates, coordinates, and makes consistent the administrative requirements, permits, inspections, and enforcement activities of six environmental and emergency response programs. These programs include:

- Hazardous materials release response plans and inventories (business plans)

- California Accidental Release Prevention Program
- Underground Storage Tank Program
- Above Ground Petroleum Storage Act Program
- Hazardous Waste Generator and Onsite Hazardous Waste Treatment programs
- California Uniform Fire Code: hazardous material management plans and hazardous material inventory statements (Cal/EPA 2011a)

Cal/EPA and other state agencies set the standards for their programs while local governments implement the standards. These local implementing agencies are called CUPAs. In Alameda and Contra Costa Counties, the CUPA regulates/oversees:

- Universal and hazardous waste generator/handler requirements
- Hazardous materials business plans
- California accidental release prevention plans or federal risk management plans
- The operation of underground storage tanks (USTs) and aboveground storage tanks (ASTs)
- Onsite hazardous waste treatment
- Inspections, permitting, and enforcement
- Proposition 65 reporting
- Hazardous materials response plan and emergency response

Beyond the statewide regulations the CUPAs administer, policies and regulations found in a number of local and regional plans (including general plans and municipal codes) address hazardous materials and wastes. Policies and regulations are intended as guides for the appropriate use of potentially hazardous materials, the cleanup of contaminated sites, and the preparation of emergency response plans.

See Section 4.11.3.3.2 for additional local pesticide regulations under the discussion of the City of Oakland Pesticide Use Policy and Ban.

The City of Berkeley also has a pesticide management policy that encourages minimizing or eliminating the use of pesticides within Berkeley under their Integrated Pest Management (IPM) scheme.

4.11.1.4 Pesticide Regulations

Cal/EPA delegates pesticide enforcement activities in CDPR under Title 3 of the CCR and the California Food and Agriculture Code. The CDPR registers pesticides for use in California and licenses pesticide applicators, pilots, advisors, dealers, brokers, and businesses. In turn, the County Agricultural Commissioner (CAC) acts as the local enforcement for CDPR. The CAC registers licensed pest control businesses and agricultural pest control advisors in the county in which they operate, requires permits and advanced notification for buying or using California restricted-use pesticides, and requires the completion of pesticide use reports for pesticides applied in the County. In addition, the CAC investigates pesticide-related injuries and illnesses

and oversees enforcement of worker training in pesticide management. Local CACs for the study area are in Alameda and Contra Costa County.

In addition, the courts have banned certain pesticides from use in the habitats of sensitive species in the State of California, as discussed in Section 4.11.1.5.

4.11.1.4.1 Pesticide Health and Safety

EPA and CDPR evaluate pesticides for potential effects on human health and the environment prior to registration and require appropriate use restrictions to be present on the pesticide label to ensure a reasonable certainty of no harm to human health and the environment. Application in compliance with pesticide labels ensures that pesticides would not be detrimental to the public health and safety when used as directed. CDPR enforces state and federal regulations that govern the safe and proper use of pesticides, including licensing of dealers and applicators, investigating pesticide incidents, ensuring product quality, and monitoring pesticide residues on commercial produce.

The county agricultural commissioners and their staff carry out enforcement activities with training, coordination, oversight, and technical and legal support provided by CDPR staff.

4.11.1.4.2 CDPR and the Office of Environmental Health Hazard Assessment (OEHHA)

The CDPR shares regulatory responsibility with OEHHA for pesticide worker safety and health programs. The Pesticide and Environmental Toxicology Branch (PETB) of OEHHA is composed of four sections. The Pesticide and Food Toxicology Section carries out risk assessment and hazard evaluation activities related to pesticides and other chemical contaminants in food and consumer products. Program staff performs activities required by legislation to review risk characterizations prepared by the CDPR and to evaluate pesticide toxicity data in support of pesticide use and regulation in California.

The activities of the Pesticide Epidemiology Section of OEHHA involve the following legislatively mandated programs: pesticide illness surveillance, epidemiological and other assistance to local health officers in the event of an outbreak of pesticide poisoning, and joint and mutual responsibility with the CDPR to develop regulations to protect workers exposed to agricultural pesticides.

The Water Toxicology Section of OEHHA performs major risk assessment and hazard evaluation activities relating to chemical contaminants in drinking water. These activities include developing health advisories, action levels, and public health goals for chemical substances in drinking water, and providing toxicological assistance for chemical monitoring activities for the drinking water supply.

The Pesticide and Environmental Toxicology Section of OEHHA evaluates chemical contaminants in fish and wildlife and develops fish consumption health advisories.

4.11.1.4.3 CDPR’s Environmental Hazards Assessment for Pesticides

The Environmental Hazards Assessment Program (EHAP) of CDPR has the lead role in implementing CDPR’s environmental protection program. EHAP collects data and analyzes the

results from studies that are conducted to measure pesticide residues in the environment, characterize drift and other offsite pesticide movement, and evaluate the effect of application methods on movement of pesticides in air. If a pesticide is determined to be a toxic air contaminant, appropriate control measures are developed to reduce emissions to levels that adequately protect public health. This is done in consultation with the California Air Resources Board. Control measures may include product label amendments, applicator training, restrictions on use patterns or locations, and product cancellations.

State and local agency regulatory responsibilities related to the protection of human and ecological health from potentially contaminated environmental media (air, water, sediments) include the following regulations:

Transport, Use, and Disposal

CCR Title 3 specifies requirements for proper storage, transportation, and disposal of pesticides and containers. CDPR and the county agricultural commissioners are responsible for enforcement. Pesticide labels provide instructions for proper handling, storage, and disposal of pesticides, as required by EPA.

Worker Health and Safety

CCR Title 3 includes pesticide worker safety regulations that specify safe work practices for employees who handle pesticides. The CCR also specifies label and warning requirements that must be met prior to pesticide application. CDPR and the local agricultural commissioner enforce the worker safety regulations. Pesticide applicators receive annual training that includes routine and emergency decontamination procedures, safety requirements for handling pesticides, and emergency first aid. The Pest Management and Licensing Branch administers CDPR's Licensing and Certification Program, which is responsible for examining and licensing pest control operators and advisors, and for certifying pesticide applicators who use or supervise the use of registered pesticides.

A similar program for workers using pesticides in non-crop settings (such as the proposed and connected project areas) is required by CDPR in accordance with the Pesticide Safety Information Series (PSIS) (Cal/EPA 2005). Training in hazard communication, medical supervision, pesticide handler safety, pesticide storage and transportation, first aid, personal protective equipment, engineering controls, and other applicable elements are required. The PSIS program was developed by CDPR with local enforcement by the CAC.

Pesticide applicators are required to use formulated pesticide products in accordance with the product label, as approved by EPA. The product label includes requirements for use of personal protective equipment for people mixing and applying the formulations, for containing the material, for proper application, and for safe disposal of any material not applied. The project supervisor must have authority to start and stop the pesticide application and be well versed in the state regulatory requirements regarding safe and legal use of the pesticide product and applicator and public safety. Finally, all personnel involved with the pesticide application must receive safety training specific to the formulated pesticide product that would be used and must follow the site safety and health plan developed for the project that would prevent exposure to

proposed pesticide formulations and other formulation constituents at concentrations that could be expected to affect health.

At a minimum, specific safety training must include information on (1) how to read and understand the product label; (2) the acute and chronic applicator exposure hazards; (3) routes and symptoms of pesticide overexposure; (4) how to obtain emergency medical care; (5) decontamination procedures; (6) how to use the required safety equipment; and (7) safety requirements and proper procedures for pesticide handling, transportation, storage, and disposal. Training records must be maintained in accordance with federal and state regulatory requirements.

Personal protective equipment is required by the product label and material safety data sheet (MSDS) when using formulated pesticide products. Federal OSHA requires that an MSDS accompany all pesticides and be available to applicators. The MSDS provides information additional to the product labels on potentially hazardous ingredients in the product. This information is provided for the safety of the applicator who may be exposed to higher concentrations of the material than the general public could contact when the material is applied and dispersed according to the label instructions. The Department of Fish and Wildlife (DFW) requires that the MSDS be on site during applications.

OSHA sets permissible exposure limits (PELs) to protect workers against the health effects of exposure to chemicals in air. PELs are regulatory limits on the amount or concentration of a substance in the air. Inhaling chemicals that are above the PEL concentration during a work day may present a health concern. PELs are enforceable. OSHA PELs are chemical specific and are based on an 8-hour time-weighted average exposure. PELs are established to protect the healthy adult worker. PELs are not applicable for the sensitive populations in the general public, such as children, youth, or nearby residents who have the potential for continuous exposure over a 24-hour period for days in succession. If work locations are documented or anticipated to have concentrations of chemicals in air that are higher than the chemical-specific PEL, then workers are required to use respirators to protect themselves against inhaling potentially unhealthy levels.

Under Cal/OSHA the following documents are required for use of hazardous substances in the workplace:

- Injury and illness prevention plan
- Emergency action plan
- Fire prevention plan
- Hazard communication plan/pesticide safety information system

4.11.1.5 Other Legislative Issues Related to Pesticides

4.11.1.5.1 Federal Injunction

On October 20, 2006, the Federal District Court for the Northern District of California issued a Stipulated Injunction in a case brought against EPA by the Center for Biological Diversity. The court’s injunction requires buffer areas around certain habitats of the California red-legged frog

(CRLF) and disallows use of certain pesticides in those habitats and buffer zones. The active ingredients glyphosate, imazapyr, and triclopyr are included in the ban.[1]

The ban includes exemptions resulting in reduced buffer areas. If the pesticide falls into the following categories, its use is restricted within 60 feet of aquatic breeding critical habitat, within 60 feet of nonbreeding aquatic critical habitat in the critical habitat areas (shown on county maps), or within 60 feet of aquatic features in the noncritical habitat sections subject to the injunction:

- Use of 1,3-dichloropropene (telone) and chloropicrin
- Localized spot treatments using handheld devices on rights-of-way, roadsides, pastures, lawns, or in forests
- Spot treatments of wasp and hornet nests
- Individual tree removal using cut stump application
- Basal bark application to individual plants
- Use of the pesticides in bait stations

The ban also provides exceptions for Endangered Species Act (ESA) approved use. If the proposed pesticide use is permissible under one or more of the following, the injunction does not apply.

- A “no jeopardy” biological opinion issued under ESA Section 7(a)(2) by USFWS and that opinion addresses the use of the pesticide and effects on the CRLF provided that such use is consistent with any incidental take statement included with USFWS’s opinion
- A “reasonable and prudent alternative” identified in a “jeopardy” biological opinion issued under ESA Section 7(a)(2) by USFWS that addresses the use of the pesticide and effect on the CRLF provided that such use is consistent with the “reasonable and prudent alternative” and any incidental take statement included with USFWS’s opinion
- A written concurrence by USFWS in a “not likely to adversely affect” determination made under ESA Section 7(a)(2) that addresses the use of the pesticide and effects on the CRLF
- An incidental take permit issued by USFWS under ESA section 10(a) that authorizes the take of the CRLF from application or use of the pesticide
- Completion of a “not likely to adversely affect” determination made by an action agency to satisfy its ESA Section 7(a)(2) consultation obligation for a particular use of a pesticide pursuant to the applicable regulations in effect at the time that the determination is made

Regardless of the possible exemptions, the injunction prohibits use in and around certain habitat areas, in general critical habitat areas, and in specified non-critical habitat sections. Standard buffers apply to these areas, as follows:

[1] The ban is described on EPA’s website. http://www.epa.gov/espp/litstatus/redleg-frog/steps-info.htm#one.

- Within the general critical habitat areas shown on county maps. All areas described by USFWS as aquatic breeding critical habitat, non-breeding aquatic critical habitat, or upland critical habitat for the CRLF and in buffer zones (60 feet for ground application or 200 feet for aerial applications) measured from the edge of the aquatic breeding, non-breeding aquatic, or upland critical habitat.
- Within non-critical habitat sections shown on county maps. All aquatic features and upland habitats and in buffer zones (60 feet for ground application or 200 feet for aerial applications) measured from the edge of the aquatic feature or upland habitat.

4.11.1.5.2 U.S. District Court Northern California San Francisco Division Injunction

On May 30, 2007, an injunction was filed by the Center for Biological Diversity, requiring that EPA make effects determinations and initiate consultation, as appropriate, with USFWS pursuant to applicable regulations in effect at the time when the determination is made, regarding the potential effects of 75 pesticide-active ingredients on the tidewater goby, delta smelt, California clapper rail, salt marsh harvest mouse, California tiger salamander, San Francisco garter snake, California freshwater shrimp, San Joaquin kit fox, Alameda whipsnake, valley elderberry longhorn beetle, and Bay checkerspot butterfly in the greater San Francisco Bay Area, including the Bay Delta, specifically covering the following California counties—Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, and San Mateo. Although there was opposition to the injunction, the U.S. District Court Northern California approved the stipulated injunction and an order on May 17, 2010 (U.S. District Court 2010). However, this injunction does not include the active ingredients glyphosate, imazapyr, and triclopyr in the pesticide formulations (Roundup, Stalker, and Garlon 4 Ultra) to be used in the proposed and connected actions.

4.11.2 Methodology

For the purpose of this assessment, hazardous materials are defined as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released. Hazardous materials include, but are not limited to, hazardous substances, hazardous wastes, and any material that a handler or the administering regulatory agency has a reasonable basis for believing would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment (California Health and Safety Code Section 25501[o]). Although often treated separately from hazardous materials, petroleum products (including crude oil and refined products such as fuels and lubricants) and natural gas are considered in this analysis because they might also pose a potential hazard to human health and safety if released into the environment. Hazardous wastes include residues, byproducts, contaminated products, or similar substances that exceed regulatory thresholds for properties of toxicity, ignitibility, corrosivity, or reactivity. Federal and state regulations identify by name specific hazardous wastes that EPA has designated as “listed wastes.” The approach for evaluation of hazardous substances (including pesticides) is two-fold. First, the methodology for evaluating impacts examines the actions that involve the hazardous substances. Secondly, the methodology evaluates the potential impacts to human health and the environment due to the application of pesticides. The second type of impact is the application of pesticides (herbicides) as part of the proposed and connected actions and the action alternative.

In order to implement this approach, the variable and diverse environments and habitats that could be affected by the use of hazardous substances, including pesticides, are identified as the study area for hazardous substances. A description of the study area for hazardous substances is provided in Section 4.11.3.1.

The following provides the two-fold methodology for the assessment of hazardous substances, including pesticides, for the proposed and connected actions.

4.11.2.1 Activities Involving Hazardous Substances

The proposed and connected actions could cause impacts related to hazardous materials and wastes. Impacts may be the result of routine hazardous materials transport, use, and disposal; the accidental release of hazardous materials and wastes because of upsets or accidents; proximity of historically contaminated sites to the proposed and connected project areas; and project aspects that would emit or handle hazardous materials, substances, or wastes near schools. The analysis included consideration of how site proximity and hazardous material and waste operations would potentially affect the proposed and connected actions and the alternatives as well as the potential effects of the proposed and connected actions and the alternatives on those operations. It identifies potential hazardous material and waste sites based on a review of environmental database record searches and aerial imagery.

The methodology for evaluating the impacts of proposed and connected activities that involve hazardous substances includes the following steps:

- Identify the types of activities that involve hazardous substances and the types of substances that would be used
- Identify the environments or habitats where the hazardous substances would be used, including previously contaminated properties near the proposed and connected project areas
- Identify and evaluate the hazards associated with the proposed and connected actions
- Identify the regulatory requirements and additional measures to prevent impacts to potentially affected habitats

4.11.2.2 Chemical Treatment

The evaluation of health impacts related to pesticide application was performed using a risk-based approach. The essence of a risk-based approach is to compare a level of estimated exposure to a certain chemical (estimated dose) to a “safe dose” and evaluate whether the estimated dose exceeds the safe dose to an extent that may lead to adverse health effects.

For the proposed and connected actions, a combined quantitative and qualitative level of risk evaluation was conducted because it provides a focused and flexible evaluation of the appropriate pesticides and those who might be exposed (receptors). The evaluation first considers existing conditions followed by an assessment of the proposed and connected actions and the alternatives. The scope and objectives of the screening level risk assessment are as follows:

- Describe existing conditions relevant to defining affected area boundaries, describe current pesticide usage, and identify possible human and ecological receptors and exposure pathways.
- Evaluate whether exposure to the herbicides proposed for use in the proposed and connected project areas could lead to unacceptable levels of project-related risk to receptors in the affected area.
- Determine whether mitigation measures need to be developed to protect the health of the evaluated receptors.

The entirety of the screening level risk assessment is presented as a technical report in Appendix F. In this EIS, the evaluation of risk-related impacts is presented in Section 5.

To meet the objectives outlined above, the screening-level risk assessment was conducted consistent with existing federal and state guidelines (EPA 1989, DTSC 1996a, 1996b) and includes the following steps:

- Identify the types of herbicides that are currently used and are proposed for future use in the affected area, including their hazardous and toxicological characteristics.
- Identify the current and proposed methods of application of herbicides, including the frequency and duration of applications.
- Identify the types of environments and habitats in the affected area that could be affected by the use of herbicides.
- Develop a conceptual exposure model that identifies the potential media in which herbicides could be found, their pathways, and fate in the environment, as well as the potentially sensitive receptors; those who could ingest, inhale, or come in contact with the herbicides.
- Determine the key human receptors and exposure pathways and ecological receptors and exposure pathways.
- Identify studies with the same chemicals, receptors, and pathways and collect toxicological information and exposure parameters and note data gaps (if any).
- Assess quantitatively the potential risk to human and environmental receptors by estimating exposure using U.S. Department of Agriculture Forest Service Risk Calculation Worksheets.
- Summarize the risk assessments and ascertain whether the estimated risks are acceptable and if additional mitigation measures are warranted.
- Discuss the assumptions and uncertainties inherent in the risk assessment process and their implications on the findings and conclusions.

FEMA recognizes that a significant body of published work is available related to federal and state approved pesticides, especially those that are commonly used. Key information sources were reviewed to narrow down the list to studies from reputable sources and risk assessments that are both current and applicable to the conditions of the East Bay Hills. The published literature was used to the extent that is relevant and useful and was supplemented by more project-specific evaluation, as appropriate.

4.11.3 Existing Conditions for Human Health and Safety

This section includes a discussion of the existing environment and current uses of hazardous substances, including pesticides, in the study area for hazardous substances.

4.11.3.1 Definition of the Study Area for Hazardous Substances

The study area for hazardous substances includes the proposed and connected project areas shown on Figures 3-1a through 3-1j in Section 3 and the associated environment that could be affected, such as receiving waters immediately downgradient from the proposed and connected project areas, as well as land immediately downwind of the chemical application areas. Soil, air, surface water, groundwater, sediments, and biota potentially containing hazardous substances, including pesticides or pesticide formulation constituents, are considered to be potential exposure media in the affected environment through which exposure to hazardous substances could occur, such as spray drift, drainage, or consumption of non-target plants or prey animals that have accumulated herbicides in their tissue.

Many of the proposed and connected project areas are adjacent to developed areas whose occupants interact with and use the resources in the project areas. Therefore, the affected environment also includes the occupants of areas adjacent to the project areas, including residents, workers, and people who travel through the affected area.

4.11.3.2 Existing Contamination In or Near the Project Areas

The built environment in and surrounding the proposed and connected project areas may have been previously affected by hazardous substances. Those sites were evaluated using the services of Environmental Data Resources (EDR), a company that provides database searches of sites that may have existing contamination or releases of pollutants that are listed on relevant agency databases. This section includes a discussion of known contamination in the project areas based on database review. This section also discusses the locations of existing or historical groundwater wells and oil and gas wells.

The proposed project areas in Miller/Knox Regional Shoreline are near industrial uses where residual soil and/or groundwater contamination may exist. The other project areas are farther away from industrial uses and freeways, and it is therefore not likely that contamination is present that could be disturbed by the proposed and connected actions.

Governmental agency records were reviewed for records of contamination in the proposed and connected project areas. Because regulated facilities may impact other properties, it is also necessary to review governmental records for the surrounding area. Appendix G provides a summary of the EDR reports, the entire EDR report, and maps of potential historical contamination sites within 1 mile of the proposed area. The EDR report lists all databases searched and information found.

A review of applicable regulatory agency documents, lists of known or potential hazardous waste sites or landfills, and properties or facilities currently under investigation for potential environmental violations was conducted to identify properties or facilities that may have the potential to adversely affect environmental conditions at the subject property. EDR used a 1-mile

search radius around the proposed and connected project area boundaries to perform a computerized search of federal, state, local, and Native American tribal databases for sites with environmental filings. These sites are shown as “listed sites” and are described in detail in Appendix G.

In total, 104 listed and mapped sites are within 1 mile of the proposed and connected project areas. Of these 104 listed sites, 7 of the sites are within project areas. Each site may be listed in more than one database. Additionally, individual sites may be listed more than once in the same database. For instance, some sites had several reported spills of oils or other hazardous substances (Emergency Response Notification System database), so those sites are listed more than once in the same database. In addition, each listed site number on the map may represent more than one site address. It should be noted that locations of five sites (listed site numbers 41, 42, 43, 50 and 53) were refined from their EDR reported location by consulting Google Earth maps. This adjustment resulted in the sites located at listed site numbers 43, 50, and 53 to not be situated within the boundaries of the proposed and connected project areas. The EDR report in Appendix G provides a list of all agency databases searched. Table 4.11-1 lists only the agency databases that when searched found results within 1 mile of the project areas.

EDR also conducted a second database search of federal and state records for existing water wells, oil and gas wells, public water supply system information, and federal radon information within a 5-mile radius from the proposed and connected project areas. A copy of the EDR well database report is provided in Appendix G. Groundwater wells are present within a 5-mile radius of the project areas, but most of the wells are closer to the bay and not in the near vicinity of the project areas.

To address the impact of a facility to the treatment areas, groundwater flow is inferred based on regional topography. The anticipated shallow groundwater flow direction is east to west. The following summary describes only the listed sites inside the proposed and connected project area boundaries.

Unmapped sites are sites identified in the EDR database report that are not mapped because of inadequate or erroneous geocode information. Such sites are designated as “orphan sites” by EDR. The EDR database report identified hundreds of orphan sites. Because of the irresolvable geocode information and the length of the orphan list, a determination cannot be made regarding whether the orphan sites identified are within the 1-mile search radius, and the orphan list was therefore not reviewed.

4.11.3.2.1 Tilden Regional Park and Strawberry Canyon-PDM

Five listed sites are within the boundaries of these project areas. San Francisco Anti-Aircraft Artillery (AAA) Battery 12 (listed site no. 42), formerly the Grizzly Peak AAA Site, is a 66.93-acre site in Tilden Regional Park classified as a formerly used defense site (FUDS). No potential hazards have been identified at this site. The AAA Battery 12 site is currently owned and maintained by EBRPD. The Tilden Corporation Yard (listed site no. 41) is in proposed project area TI015 in Tilden Regional Park. The Corporation Yard is part of the AAA Battery 12 site and is listed as having an underground storage tank. The site also has waste discharge requirements issued by the SWRCB.

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Table 4.11-1. Review of Agency Databases

	Database	Description of Database/Effective Date	Sites Identified Within 1 Mile of Project Area	Listed Sites in Project Areas	Map IDs (Names) of Listed Sites in Project Areas
Federal	NPL	National Priorities List (NPL), also known as Superfund, is a subset of the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) and identifies sites for priority cleanup under the Superfund Program.	1	0	
	CERCLIS	CERCLIS contains data on potentially hazardous waste sites reported to EPA. Contains sites proposed for or on the NPL and sites in the screening and assessment phase.	2	0	
	CERC-NFRAP	The CERCLIS-no further remedial action planned (NFRAP) list identifies sites that have been removed from the CERCLIS list.	5	0	
	RCRA	RCRAInfo is EPA's system for providing access to information on facilities that handle hazardous waste under the Resource Conservation and Recovery Act of 1976 (RCRA) and the Hazardous and Solid Waste Amendments of 1984.	0	0	
	CORRACTS	RCRA handlers ordered to implement corrective actions.	3	0	
	RCRA TSDs	RCRA treatment, storage, and disposal (TSD) facilities.	3	0	
	RCRA LQG	RCRA large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste or over 1 kg of acutely hazardous waste in a month.	7	0	
	RCRA SQG	RCRA small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste in a month.	16	1	**40** - (EBMUD Berkeley View 1 and 2 Re),
	RCRA NonGen	RCRA nongenerators are registered under RCRA but do not presently generate hazardous waste.	6	0	
	US ENG CONTROLS	Sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to eliminate pathways for regulated substances to enter environmental media or affect human health.	1	0	

Table 4.11-1. Review of Agency Databases

	Database	Description of Database/Effective Date	Sites Identified Within 1 Mile of Project Area	Listed Sites in Project Areas	Map IDs (Names) of Listed Sites in Project Areas
Federal (cont.)	US INST CONTROL	Sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.	1	0	
	US BROWNFIELDS	Brownfields properties addressed by cooperative agreement recipients and brownfields properties addressed by targeted brownfields assessments.	1	0	
	FUDS	Formerly used defense sites (FUDS) where the U.S. Army Corps of Engineers is actively working or would take necessary cleanup actions.	2	1	**42** - (SF Anti-Aircraft Artillery Battery 12)
	ROD	Record of decision (ROD) documents mandating a permanent remedy at an NPL site and containing technical and health information to aid the cleanup.	1	0	
	MINES	Mine identification numbers issued for mines active or opened since 1971 and violation information.	1	0	
	TRIS	Toxic Release Inventory System (TRIS) identifies facilities that release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.	1	0	
	FTTS	FIFRA/TSCA Tracking System (FTTS). FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act)/TSCA (Toxic Substances Control Act) FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA, and EPCRA (Emergency Planning and Community Right-to-Know Act).	1	0	
	HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing	1	0	
	PADS	The PCB Activity Database (PADS) identifies generators, transporters, commercial storers and/or brokers and disposers of PCBs who are required to notify the EPA of such activities.	1	0	

Table 4.11-1. Review of Agency Databases

	Database	Description of Database/Effective Date	Sites Identified Within 1 Mile of Project Area	Listed Sites in Project Areas	Map IDs (Names) of Listed Sites in Project Areas
Federal (cont.)	RADINFO	The Radiation Information Database (RADINFO) contains information about facilities that are regulated by EPA regulations for radiation and radioactivity.	1	0	
	FINDS	Facility Index System (FINDS). FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS.	24	2	**40** - (EBMUD Berkeley View 1 and 2 Re), **41** – (EBRPD Tilden Corporation Yard),
	2020 COR ACTION	The 2020 Corrective Action Universe is a RCRA cleanup baseline that includes a wide variety of sites that need corrective action.	2	0	
	PRP	A listing of verified Potentially Responsible Parties (PRP).	1	0	
State and Local	HIST Cal-Sites	The DTSC Calsites database contains potential or confirmed hazardous substance release properties. In 1996, California EPA reevaluated and significantly reduced the number of sites in the Calsites database. No longer updated by the state agency. It has been replaced by ENVIROSTOR.	6	0	
	CA BOND EXP. PLAN	Bond expenditure plan. Department of Health Services developed a site-specific expenditure plan as the basis for an appropriation of Hazardous Substance Cleanup Bond Act funds. It is not updated.	4	0	
	SWF/LF	The solid waste facilities /landfill sites (SWF/LF) records contain an inventory of solid waste disposal facilities or landfills in a particular state. The data comes from the Integrated Waste Management Board's Solid Waste Information System (SWIS) database.	1	0	

Table 4.11-1. Review of Agency Databases

	Database	Description of Database/Effective Date	Sites Identified Within 1 Mile of Project Area	Listed Sites in Project Areas	Map IDs (Names) of Listed Sites in Project Areas
State and Local (cont.)	WDS	California Water Resources Control Board - Waste Discharge System.	5	1	**41** - (EBRPD Tilden Corporation Yard)
	NPDES	A listing of National Pollutant Discharge Elimination System (NPDES) permits, including storm water.	9	1	**41** - (EBRPD Tilden Corporation Yard)
	CORTESE	Hazardous Waste & Substances Site List. The sites for the list are designated by the State Water Resources Control Board [LUST], the Integrated Waste Board [SWF/LS], and the Department of Toxic Substances Control [CALSITES].	8	0	
	HIST CORTESE	Hazardous Waste & Substances Site List. The sites for the list are designated by the State Water Resources Control Board [LUST], the Integrated Waste Board [SWF/LS], and the Department of Toxic Substances Control [CALSITES].	42	0	
	LUST	State Water Resources Control Board's Geotracker's Leaking Underground Fuel Tank Report. Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents.	45	0	
	CA FID UST	The Facility Inventory Database (FID) contains a historical listing of active and inactive underground storage tank locations from the State Water Resources Control Board. Refer to local/county source for current data.	21	0	
	SLIC	Statewide SLIC Cases. The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges. This is the State Water Resources Control Board Database. Regional boards also maintain databases.	12	0	
	UST	Active UST facilities gathered from the local regulatory agencies.	2	1	**41** - (Tilden Corporation Yard)
	HIST UST	The Hazardous Substances Storage Container Database is a historical listing of UST sites. Refer to local/county source for current data.	16	1	**44** - (Environment, Health and Safety, Department of Facilities Management Heating Plant)

Table 4.11-1. Review of Agency Databases

	Database	Description of Database/Effective Date	Sites Identified Within 1 Mile of Project Area	Listed Sites in Project Areas	Map IDs (Names) of Listed Sites in Project Areas
State and Local (cont.)	NY MANIFEST	Lists and tracks hazardous waste from the generator through transporters to a TSD facility.	1	0	
	SWEEPS UST	Statewide Environmental Evaluation and Planning System. This underground storage tank listing was updated and maintained by a company contacted by the SWRCB in the early 1990s. The listing is no longer updated or maintained.	26	1	**41** - (EBRPD)
	CHMIRS	California Hazardous Material Incident Reporting System. CHMIRS contains information on reported hazardous material incidents (accidental releases or spills).	10	0	
	MCS	The State Water Resources Control Board and nine regional water control boards partner with the Department of Defense (DoD) through the Defense and State Memorandum of Agreement (DSMOA) to oversee investigation and remediation of water quality issues at military facilities.	1	0	
	AST	State Water Resources Control Board. Aboveground petroleum storage tank facilities, registered aboveground storage tanks.	6	1	**44** - (317 University Hall)
	NOTIFY 65	All Proposition 65 incidents reported to counties by the State Water Resources Control Board and the Regional Water Quality Control Board.	5	0	
	DEED	Site Mitigation and Brownfields Reuse Program facility sites with deed restrictions and Hazardous Waste Management Program facility sites with deed or land use restriction.	5	0	
	VCP	Low threat level properties with either confirmed or unconfirmed releases for which the project proponents have requested that DTSC oversee investigation or cleanup activities and have agreed to cover DTSC's costs.	1	0	
	ENF	Water Board Enforcement Actions.	11	0	
	RESPONSE	Confirmed release sites where Cal EPA DTSC is involved in remediation either in a lead or oversight capacity. These confirmed release sites are generally high priority and high risk.	4	0	

Table 4.11-1. Review of Agency Databases

	Database	Description of Database/Effective Date	Sites Identified Within 1 Mile of Project Area	Listed Sites in Project Areas	Map IDs (Names) of Listed Sites in Project Areas
State and Local (cont.)	HAZNET[1]	Facility and manifest data. Data from the copies of hazardous waste manifests received each year by DTSC.	34	3	**41** - (Tilden Corporation Yard), **47** - (EBRPD), **50** - (Grizzly Peak)
	EMI	Emissions Inventory Data. Toxics and criteria pollutant emissions data collected by the ARB and local air pollution agencies.	3	0	
	ENVIROSTOR	The California Department of Toxic Substances Control database identifies both known and potential hazardous substances sites. The database has been replaced by EnviroStor. EnviroStor provides similar information that was available in Cal-Sites. It also provides identification of formerly contaminated properties released for reuse, recorded environmental deed restrictions to prevent inappropriate land uses, and risk characterization information used to assess potential impacts to public health and the environment at contaminated sites.	19	0	
	HWT	A listing of hazardous waste transporters. In California, unless specifically exempted, it is unlawful for any person to transport hazardous wastes unless the person holds a valid registration issued by DTSC. A hazardous waste transporter registration is valid for 1 year and is assigned a unique registration number.	1	0	
	HWP	Detailed information on permitted hazardous waste facilities and corrective action (“cleanups”) tracked in EnviroStor.	3	0	

[1] HAZNET is the EDR database for hazardous manifests

A sparsely developed portion of the UCB campus is in the Strawberry Canyon-PDM proposed project area. There are two listings in the EDR report, both listed at site no. 44 at the edge of Strawberry Canyon-PDM, for minor spills, hazardous waste manifests, and an AST. A portion of what is listed at site no. 44 may be on other parts of the UCB campus. The extent of existing contamination from these minor spills is unknown.

Also near the edge of the Strawberry Canyon-PDM project area is listed site no. 40, designated East Bay Municipal Utility District Berkeley View reservoirs 1 and 2. This site is listed as a RCRA small quantity generator of lead. The two tank reservoirs are located north of the northwestern corner of Strawberry Canyon-PDM, at the edge of proposed project area TI012.

4.11.3.2.2 Claremont Canyon Regional Preserve

Two listed sites are in Claremont Canyon Regional Preserve. The EDR database for hazardous waste manifests (HAZNET) reported that the EBRPD facility in proposed and connected project areas CC008 generated 0.21 ton of asbestos-containing waste that was disposed of in a landfill and generated 1.96 tons of unspecified oil-containing waste that was recycled. The generating facility is at 734 Gelston Avenue (listed site 47).

The second site, at 5172 Grizzly Peak Boulevard (listed site no. 50) in proposed project area CC012, was listed in HAZNET for disposing an inorganic solid waste.

4.11.3.3 Current Use of Hazardous Substances Including Pesticides by Subapplicants

This section describes the subapplicants' policies and programs related to use of hazardous substances, including pesticides.

4.11.3.3.1 EBRPD

EBRPD Vegetation and Pest Management Programs

Beginning in the 1970s, EBRPD has attempted to limit the use of toxic chemicals on its parklands. The 1987 EBRPD Pest Management Policies and Practices included a policy stating, "In accordance with the accepted principles of ecology, EBRPD will strive to implement an integrated pest management program that eliminates the use of chemicals as much as feasible whenever alternative methods are effective" (EBRPD 1987). EBRPD identified a number of wildland management issues in the 1997 Master Plan (EBRPD 1996), as follows: management of wildland areas may require the use of integrated pest management (IPM)[2] practices for the control of plant and animal pests. Agricultural sites and cultivated areas within EBRPD

[2] The EBRPD definition of IPM is "a strategic approach for preventing and suppressing pest problems before they reach unacceptable levels. Using IPM means selecting and integrating the most appropriate combinations of available pest control methods (including cultural, mechanical, chemical, and biological) for a given site/pest occurrence in ways that minimize risk to public safety, health and the environment. While the goal of IPM programs is the same—long-term resolution to pest problems—the actual specific set of strategies selected would vary by park location, the season, type of pest, habitat considerations, level of desired control and cost factors. Additional, current practices would change as new information and new technologies are developed." (EBRPD 2005)

jurisdiction may also be managed in accordance with IPM methods to control noxious weed infestations, brooms, and other invasive non-native plants. The use of IPM methods by EBRPD is to minimize the impact of undesirable species on natural resources and to reduce pest-related health and safety risks to the public in developed facilities and/or high-use recreational areas. EBRPD initiated its Proposed Pest Species Management Program in 1982 (EBRPD 1982). In 1987, a more comprehensive IPM plan was prepared and underwent California Environmental Quality Act (CEQA) review.[3] The 1987 IPM plan was implemented beginning in 1988 (EBRPD 1987). A summary of the plan follows. As required by state and local requirements, EBRPD analyzes annual pesticide usage in the areas under its jurisdiction. The latest pesticide use reports available for review as of the writing of the EBRPD Vegetation Plan Environmental Impact Report were for 2007 and 2008 (EBRPD 2008 and EBRPD 2009a). EBRPD used IPM methods to minimize the impact of undesirable species on natural resources and to reduce pest-related health and safety risks to the public in developed facilities and high-use recreational areas.

1987 Integrated Pest Management Plan

The 1987 Pest Management Policies and Practices for EBRPD, Resolution Number 1987-11-325 (1987 IPM plan), was prepared to consolidate all relevant EBRPD board-adopted policies, administrative directives, and "state of the art" pest management practices pertaining to agricultural and structural uses on EBRPD lands. The plan is supported by the EBRPD Board of Directors and staff, an IPM specialist, and two advisory committees: the Pest Management Advisory Committee (PMAC)[4] and the Ecology Committee.[5]

The major implementation components of the plan include (1) monitoring program for pests; (2) use of pesticides only with prior authorization (by the IPM specialist or PMAC); (3) completion of an IPM checklist and pesticide use report; (4) notification and posting; (5) general chemical safety and environmental concerns, including periodic review of records of pesticide use by the PMAC to ensure compliance with applicable rules and regulations; and (6) IPM training program for workers. The plan was prepared to set a framework for use of IPM methods within EBRPD lands and to comply with local, state, and federal requirements for pesticide management.

EBRPD Annual Pesticide Use, 2007

The 2007 Pesticide Use Report for EBRPD (EBRPD 2008) includes pest management needs and practices within the properties owned and managed by EBRPD. The EBRPD list of approved pesticides in 2007 included Roundup (glyphosate), Surflan (oryzalin), Banvel (dicamba), copper sulfate, Garlon (triclopyr), Casoron (dichobenil), and Chlorophacinone (inadandione). All of

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[3] A Negative Declaration was prepared on the 1987 IPM Plan (not available for review).

[4] The Pest Management Advisory Committee (PMAC) is a five-member professional advisory committee appointed by the board that oversees the IPM program effectiveness, develops long-term pest management programs, among other tasks.

[5] The Ecology Committee is a joint union-management committee with two union representatives and two representatives appointed by EBRPD management staff and at least two Board of Directors members. The function is advisory through recommendations to the EBRPD board, PMAC, or staff.

these pesticides are considered EPA Category III and IV pesticides, "use with caution" (EPA 2007)[6] No category I (danger) or category II (warning) herbicides were on the board-approved list of herbicides for EBRPD in 2007.

The amount of each pesticide used by EBRPD is tracked and accounted for on an annual basis. In addition, the office of the IPM specialist advises EBRPD park supervisors and concessionaires (including golf courses) on how to work toward the goal of reducing the need and number of annual pesticide applications. Prior authorization by the IPM specialist is required before purchase and/or use of a pesticide is permitted for accountability and to ensure compliance with requirements for worker training.

The overall usage in 2007 of EBRPD board-approved pesticides (Roundup, Surflan, Banvel, Garlon, Casoron, and Chlorophacinone) was similar to that recorded in 2006, with a slight increase of 1.5% in Roundup use for park operations and a decrease in use of 6.5% used in resource management projects.

EBRPD Annual Pesticide Use, 2008

The beginning of EBRPD's 2008 Annual Analysis of Pesticide Use (EBRPD 2009a) states that EBRPD's approved list of pesticides included:

- Roundup (glyphosate) – herbicide
- Surflan (oryzalin) – herbicide
- Banvel (dicamba) – herbicide
- Copper sulfate – algicide, molluscicide
- Garlon (triclopyr) – herbicide
- Casoron (dichlobenil) – herbicide
- Diphacinone (rozol) – rodenticide

The overall usage in 2008 of EBRPD board-approved pesticides (Roundup, Surflan, Banvel, Garlon, Casoron, and Diphacinone) was similar to that recorded in 2007, with a slight increase of Roundup use (29%) for park operations and a decrease (25%) of use in resource management projects. Note that the 2007 report listed Chlorophacinone as an approved pesticide but the 2008 report listed Diphacinone.

This report lists various EBRPD areas and how much of each of the above-mentioned (except copper sulfate) pesticides were used in each area. The 2008 Annual Analysis of Pesticide Use also contains an approved list of pesticides for EBRPD for 2008 in that report's Appendix A. The approved list in this appendix includes more than the aforementioned list of approved pesticides. The following additional approved pesticides are included:

- Oxadiazon (Ronstar) – herbicide

[6] This material is subject to revision pending compilation of an IPM Golf Course Plan. The EBRPD IPM policy permits use of pesticides not on the board-approved list with the approval of the IPM specialist (EBRPD 2005). This provides a measure of flexibility in the program to allow specific limited-purpose pest control using non-approved pesticides (EBRPD 2005).

- Amorphous silica gel (Dri-Die) – insecticide
- Ant traps or stakes (arsenic trioxide, boric acid) – insecticide
- Bacillus thuringiensis (dipel, thuricide) – insecticide
- Hydrated lime and copper sulfate (Bordeaux mixture) – fungicide/insecticide
- Chlorophacinone (Rozol)
- Copper napthenate – wood preservative
- Gas cartridges – fumigant for burrowing rodents
- Rodeo (glyphosate) - herbicide
- Insecticidal soap (Safers) – insecticide
- Pyrethrum (pyrenone) – insecticide
- Scotts Fertilizer Plus (has benomyl) – fungicide
- Sulfur – fungicide
- Pathfinder (triclopyr)– herbicide

In 2008, Transline (chlopyralid) was an experimental herbicide under review. Habitat (imazapyr, an aquatic herbicide) was also under review in 2008. The report does not say how much of these herbicides were used.

At EBRPD's golf courses, fungicides are also used. In 2008, Tilden golf course used the following fungicides, which were all under review at the time, Mancozeb, Thiophanate-methyl, Quintozene, Chlorothalonil, Flutolanil, Vinclozdin, and Iprodine. The Tilden Golf Course also used Roundup and Powerzone (carfentrazone-ethyl) herbicides and Primo/Proxy plant growth inhibitor. Powerzone was not listed by EBRPD as an approved pesticide.

EBRPD Hazardous Materials Business Plans

EBRPD has a hazardous materials business plan for its Tilden Corporation Yard, which houses Fire Station #1, and for a central warehouse that supplies pesticides to EBRPD at large. EBRPD's proposed and connected actions would be conducted from the Tilden Corporation Yard.

EBRPD prepared its most recent hazardous materials business plan in 2010. EBRPD did not include pesticides in that plan because it did not use a sufficient quantity of pesticides to warrant their inclusion in the plan. The 2010 plan was not made available and therefore was not reviewed. EBRPD stated that although it has used Roundup in the past, only Garlon 4 would be used in its proposed and connected project areas (Rasmussen 2011).

EBRPD's Prescriptions for the Control of Invasive Plant Species and Noxious Weeds (EBRPD 2009b)

The document prescribes control methods for various types of plants, including specific herbicides to be used for each plant type. The document states that whatever is used by EBRPD, or their contractors, should be in accordance with EBRPD's Pest Management Policies and Practices Resolution.

4.11.3.3.2 City of Oakland

City of Oakland Pesticide Use Policy and Ban

Under a resolution passed on December 16, 1997, Oakland currently bans the use of pesticides with 11 stated exemptions. For certain exemptions, including Forestry Management applications, restrictions were imposed, including conformance with Alameda County Health Agency guidelines, and use of the least hazardous effective available pesticide that is also approved and registered with EPA and CDPR. Any application of pesticides requires the use of applicators that are licensed by the State of California as pest control operators and that public notification is provided prior to any treatment. Treatment must also include marker dyes and public education programs. Involvement of the Citizens' IPM Advisory Committee is mandated to provide advisement to the City Council on pest control practices.

In March 2010, the Oakland City Council issued a report on preparation of an IPM plan for Oakland that authorized certain pesticide uses. The report described application of herbicides in fuel reduction projects.

A report was issued on March 22, 2005, regarding preparation of environmental documents under CEQA for a limited exemption to the ban on pesticide uses for fuel reduction projects. The following requirements were included in the 2005 resolution.

> **Herbicide Application**. Aerial or ground spraying is not permitted under this policy. When herbicides are needed for vegetation control, best management practices (BMPs) call for direct application to the plant or tree either by hand painting the herbicide directly on to the cambium of the freshly cut tree or plant stump or bottle spritzing, no further than 6 inches away, onto freshly cut pampas grass clumps. In order to apply the herbicide to the stump or grass clump, all of the plant or tree's foliage (leaves, branches, and trunks) must be hand or mechanically cut away until nothing is left but a stump or clump. When glyphosate and triclopyr are applied in this manner, the herbicide is absorbed within the plant or tree's system and does not migrate into the surrounding soil.
>
> **Herbicide Formulations**. The exemption would be limited to the use of two herbicides: glyphosate (in formulations such as Roundup or Rodeo) and triclopyr (in formulations such as Garlon and Pathfinder). These are federally and California-registered pesticides for the control of woody plant species and broad leaf plants in right of ways, forests, open space parks, ditch banks, and maintenance of wildlife corridors. The EPA categorically ranks herbicide toxicity on a scale of one to four as follows:
>
> Category One - Highly Toxic, Category Two - Moderately Toxic, Category Three - Slightly Toxic, Category Four - Not Acutely Toxic. Both glyphosate and triclopyr have received the lowest ranking for toxicity (Category Four). In accordance with the city's IPM policy and BMPs, the choice of formulation for each type of application would be determined based on environmental factors as well as the product's capabilities. Glyphosate and triclopyr would only be used when conditions and BMPs demonstrate that a chemical treatment would be the most effective approach and would only be applied to the list of plants previously identified in this report and those new non-native

plants that may be identified in the Wildfire Prevention Assessment District's yearly report.

Use of Herbicides by Surrounding Jurisdictions. The cities of Berkeley and Oakland are the only two jurisdictions in Alameda County that either ban or partially ban the use of herbicides for weed control. Although the City of Berkeley has a total pesticide ban, the UCB uses herbicides for vegetation management in the Berkeley Hills within Berkeley city limits. Other public agencies utilizing herbicides include EBRPD and East Bay Municipal Utility District. Both agencies have fire prevention and vegetation management responsibilities within Oakland city limits (City of Oakland 2005).

However, the document titled *Wildfire Prevention Program 2008-2010, Bi-Annual Vegetation Management Plan*, prepared by the City of Oakland Fire Department, provides a description of ongoing activities related to chemical treatment for an herbicide demonstration project along Shepherd Canyon Road on five city parcels next to the Municipal Corporation Yard and Oakland Fire Department Station 24. The following excerpt (p. 23) includes the use of Stalker (imazapyr), which is not permitted under the City of Oakland IPM policy above:

> The herbicide prescription would be written by a certified pesticide applicator and the application would follow the label directions. The herbicide solution would be applied to the cambium layer of the freshly cut tree stump within a few minutes of felling. The herbicide mixture would likely consist of a combination of Garlon 4 (triclopyr) and Stalker (imazapyr) in a solution of esterified seed oil, water, and marking dye. A typical tree requires 1 to 2 ounces of diluted solution (0.5 ounces solution per lineal foot of cambium). All cut tree stumps shall receive semiannual follow-up treatment of herbicides (Garlon 4, Stalker, and Roundup) on any emerging stump sprouts to ensure the permanent elimination of eucalyptus from the project area. Follow-up treatment of sprouts would be conducted until 100% removal is obtained.

The Oakland pesticide ban allows "the use of pesticidal soaps, insect growth regulators, microbials, botanicals, synthetic pyrethroids, horticultural oils, and insecticidal bait stations" but does not provide an exemption for the use of Stalker (imazapyr).

In addition, the city provided a response to questions asked during preparation of this EIS describing application of pesticides to cut stumps and follow-up treatments, which include the use of Garlon 4 and Stalker, as follows:

> During the project, the native under story would be protected while the non-native trees would be removed and their stump cambium chemically treated with herbicide to prevent resprouting. Felled eucalyptus and pine would be either removed from the site or in some cases chipped and scattered across portions of the project site. Logs would be placed and retained as a component of the sediment/erosion control measures to be employed and would serve as habitat supporting a variety of wildlife. Protection of the native species and ongoing management after project completion would ensure a successful conversion protective of natural and recreational resource values, including but not limited to habitat, hydrology, soils and geology, and air quality. All cut eucalyptus stumps shall receive annual follow-up treatment of herbicides (Garlon 4, Stalker) on any emerging stump

sprouts to ensure the permanent elimination of eucalyptus from the project area. Follow up treatment of resprouts and seedlings emerging from the latent seed stock present in the project area would be managed over time to prevent recolonization of this invasive species. Additionally, annual re-inspection of the defensible spaces ensures that the homes and business in the project area continue to maintain at least 100-foot clearance.

4.11.3.3.3 UCB

UCB Vegetation Programs

UCB has had a UCB Fire Mitigation Committee (UCFMC) since the mid-1980s whose mission has been to identify, mitigate, control, reduce, and report on fire risk in and surrounding UCB campus. From the mid-1980s to 1995, fire mitigation work was prescribed by an earlier fire ecology consultant and was then passed through the University of California Environment, Health and Safety (EH&S) group to Physical Plant – Campus Services. The fire prevention work was conducted primarily by gardeners and groundskeepers. The 1991 Tunnel Fire and the formation of the Hills Emergency Forum led to additional focus on fire risk and prevention in the hills of the UCB campus. In June 1995, the current fire ecology consultant (Safe Solutions Group) developed annual fire prevention actions. In 2001, the UCFMC took on a pilot project to thin eucalyptus trees that had been killed in a freeze. Eucalyptus reduction activities were continued based on the success of that project. However, because the Hill Area is home to the headwaters to several watersheds and streams and at least one sensitive species, the UCFMC needed to balance the fire prevention needs with environmental protection goals; hence, the 2020 Hill Area Fire Fuel Management Program (UCB 2003) was developed.

The UCFMC manages an ongoing program that addresses fires that initiate in the hilly eastern portions of the campus, where wildfires threaten Priority 1 (private) and Priority 2 (public) structures and surrounding vegetation. These areas continue to be treated under state and local fire codes. Priority 3 areas (ornamental and wildlands capable of generating or feeding spot fires) were added under the 2020 Hill Area Fire Fuel Management Program (UCB 2003), which updated and formalized the Hill Campus fire risk management plan and procedures. The 2020 HAFFMP describes local fuel types, prescribes mitigation actions, and identifies constraints to mitigation. The purpose of the 2020 HAFFMP is to prescribe and implement fire fuel hazard mitigation in the human population concentrations, adjacent vegetation, and evacuation routes. There are two proposed types of actions: Priority 1 and 2, which focuses on the intermix of vegetation and structures, and Priority 3, which focuses on the management of vegetation to reduce the fuel load in the wildlands. The prescriptions are intended to be both preventive and facilitative efforts that would include maintaining staging areas and firebreaks and coordinating fire-fighting personnel and equipment access. Priority 3 management zones include those where treatment is feasible and those where it is not.

The 2020 HAFFMP includes fuel management techniques and associated mitigation measures, which are provided in Appendices B and D of the 2020 HAFFMP (adapted from EBRPD Vegetation Management Projects Alameda and Contra Costa Counties, California HMGP #919-515-24, April 2003). The HAFFMP prescribes treatment methods for stands of eucalyptus, mixed hardwoods, and Monterey pine as well as for native and non-native understory and brush. The program indicates that each specific area would be evaluated for the potential issues related

to application of pesticides and other environmental concerns prior to their use and would include implementation of necessary mitigation measures to minimize or prevent impacts, which are listed in Appendix B of the HAFFMP.

UCB Hazardous Materials Business Plan

UCB's hazardous materials business plan (UCB 2010) covers UCB properties in the City of Berkeley except the Physical Plant Campus Services at 2000 Carleton Street in Berkeley. Only hazardous materials stored on site at or above reportable quantities are inventoried in the plan. The reporting quantities are 55 gallons for liquids, 500 pounds for solids, and 200 cubic feet for compressed gases.

The hazardous materials business plan lists the hazardous chemicals (and their locations) stored in aggregate over regulatory reporting quantities, universal waste generated on campus, and etiological agents (human cells, bacteria, etc.) and radiological chemicals.

The plan also includes a chemical inventory with details regarding types of hazardous materials. The plan indicates that the following herbicides, pesticides, and fertilizers are stored in large quantities onsite:

- Gopher Getter Bait (diphacinone)
- Granusol magnesium (fertilizer)
- Fertilizer 20-20-20
- Best Fairway Gold 24-3-16
- Uflexx Fertilizer
- Calcium nitrate

UCB Herbicide Use Records

UCB provided herbicide use records for the past 10 years (Klatt 2011b). The use records were for the Physical and Environmental Planning Department and excluded uses by other UCB entities, such as the Grounds, Intercollegiate Athletics, Botanical Garden, and Recreational Sports departments. The herbicide records documented applications in fuel reduction areas near proposed project areas, with some possible overlap into the Frowning Ridge-PDM project area. The herbicides used included glyphosate sprayed on cut stumps, imazapyr applied as a basal bark spray, triclopyr applied to foliage using low pressure, and clopyralid applied to foliage using high pressure. Clopyralid has not been used since 2006.

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4.12 Public Services, Utilities, and Recreation

4.12.1 Public Services and Utilities

This section includes a description of existing public services (police, fire, hospitals) and utilities (municipal water supply, wastewater, solid waste disposal, and energy) that could be affected by the proposed and connected actions. This section refers to the area in which public services and utilities could be affected as the study area.

Transportation infrastructure is discussed in Section 4.14.

4.12.1.1 Regulatory Setting

Regulations that govern provision of public services are generally local. Policies pertaining to public services, utilities, and infrastructure in the study area are listed below for the State of California, Contra Costa and Alameda counties, the cities of Richmond, El Cerrito, Berkeley, Oakland, and San Leandro, EBRPD, and UCB.

4.12.1.1.1 State

California Integrated Waste Management Act of 1989

The California Integrated Waste Management Act of 1989 requires each county to establish a task force to coordinate the development of city source reduction and recycling elements and a countywide siting element. Cities are required to prepare and submit a source reduction and recycling element to the county that includes the following components: waste characterization, source reduction, recycling, composting, solid waste facility capacity, education and public information, funding, special waste (asbestos, sewage sludge, etc.), and household hazardous waste. Each county is required to prepare a source reduction and recycling element for its unincorporated area(s) with the same components described above, and a countywide siting element specifying areas for processing or disposal sites with 15 years of capacity for solid waste generated in the jurisdiction that cannot be recycled. Each county is also required to prepare and adopt an Integrated Waste Management Plan and have submitted to the California Integrated Waste Management Board. The plan must include all of the elements described above.

4.12.1.1.2 Regional and Local

Contra Costa County

The Public Facilities/Services Element of the Contra Costa County General Plan includes the following policies related to public services and infrastructure (County of Contra Costa 2005c).

Policy 7-16. Water service systems shall be required to meet regulatory standards for water delivery, water storage, and emergency water supplies.

Policy 7-59. A maximum response time goal for priority 1 or 2[1] calls of 5 minutes for 90% of all emergency responses in central business district, urban, and suburban areas shall be strived for by the sheriff when making staff and beat configuration decisions.

Policy 7-62. The County shall strive to reach a maximum running time of 3 minutes and/or 1.5 miles from the first-due station, and a minimum of three firefighters to be maintained in all central business district (CBD), urban, and suburban areas.

Policy 7-63. The County shall strive to achieve a total response time (dispatch plus running and set-up time) of 5 minutes in central business district, urban, and suburban areas for 90% of all emergency responses.

Policy 7-88. Solid waste disposal capacity shall be considered in county and city land use planning and permitting activities along with other utility requirements, such as water and sewer service.

Policy 7-99. Solid waste hauling, with the exception of residential waste collection trucks, on collectors and local streets through residential areas should be avoided.

Alameda County

The Public Services and Facilities Element of the draft Castro Valley General Plan (County of Alameda 2011) states that the Alameda County Fire Department responds to 81% of its calls for fire and medical emergencies in 3 minutes or less. This is faster than the median response time of 4 minutes and 53 seconds for all fire departments in the county.

Average response times for the Sheriff's Office are 11 minutes and 48 seconds for calls requiring an immediate emergency response and 17 minutes and 13 seconds for non-emergency calls requiring an urgent response. This is substantially higher than the median emergency response time of 4 minutes and 25 seconds for all Alameda county police service providers (County of Alameda 2011).

The element of the draft Castro Valley General Plan also contains the following relevant policy:

Policy 9.3-1 Water Supply. Coordinate with the East Bay Municipal Utilities District (EBMUD) to ensure the availability of water supply and distribution systems to meet the needs of present and future residents and businesses, including fire protection needs.

City of Richmond

The Public Safety and Noise Element of the City of Richmond General Plan contains the following policies that address police and fire services in the city (City of Richmond 2011d):

Policy SN2.1 Crime Prevention and Response. Promote crime prevention strategies and provide a high level of response to incidents. Timely response to incidents and monitoring in

[1] Priority 1 calls are in progress emergencies, such as shootings, robberies, burglaries, and assaults. Priority 2 calls are immediate emergencies, but not in progress, where the suspect is no longer present.

areas with high crime rates should be part of a comprehensive strategy to reduce crime in the community.

Policy SN2.2 Level of Service. Provide a high level of police and fire service in the community. Secure adequate police and fire and collaborate with neighboring jurisdiction and partner agencies to adequately respond to emergencies and incidents to all parts of the city.

Policy SN2.3 Fire Safety. Regularly update policies that would protect the community and its urban and natural areas from fire hazards. In areas designated by the Richmond Fire Department as having a high fire hazard, ensure adequate fire equipment, personnel, firebreaks, facilities, water, and access for a quick and efficient response in any area.

The Richmond Fire Department's goal is to respond to 85% of emergency calls in 6 minutes or less (City of Richmond 2011d).

City of El Cerrito

Policies from the City of El Cerrito General Plan that address fire and police response times are listed below (City of El Cerrito 1999).

Policy PS2.2 Response Time. Maintain an average emergency response time for the first fire engine of less than 6 minutes for 95% of all emergency calls for service, provided adequate financial resources are available.

City of Berkeley

The Berkeley General Plan does not contain policies that address police or fire response times (City of Berkeley 2003). The Environmental Management Element of the City's General Plan contains the following relevant policy:

Policy EM-7 Reduce Wastes. Continue to reduce solid and hazardous wastes.

City of Oakland

Policies and actions from the City of Oakland (Oakland) General Plan that address fire response times are listed below (City of Oakland 2004).

Policy FI-1. Maintain and enhance the city's capacity for emergency response, fire prevention and fire-fighting.

Action FI-1.2. Strive to meet a goal of responding to fires and other emergencies within 7 minutes of notification 90% of the time.

City of San Leandro

Policies from the Community Services and Facilities Element of the City of San Leandro General Plan address fire and police response times (City of San Leandro 2002).

Policy 45.01 Levels of Service. Maintain high-quality police and fire protection services through the most efficient and effective possible means. The following minimum level of service standards for police and fire response time (exclusive of dispatch time) shall be maintained:

Police Services. 5-minute response time for 90% of all Priority 1 calls.

Fire Services. 5-minute response time for 90% of all medical calls; 10-minute response time for 90% of all fire calls.

Another policy in the element relates to utilities and infrastructure:

Policy 52.04 Wastewater Collection and Treatment. Maintain efficient, environmentally sound, and cost-effective wastewater collection and treatment services.

4.12.1.2 Methodology

Existing public services and infrastructure in the study area were identified based on information provided in general plans, city websites, regional and national utilities databases, and personal communications. Service providers and their capacity to respond to demands for service are described. Existing services and infrastructure are organized by service type and summarized below for counties, cities, EBRPD, and UCB.

4.12.1.3 Existing Public Services and Infrastructure

Fire, police, hospital services, utilities, and infrastructure are described below for the project area.

4.12.1.3.1 Fire Services

Fire protection services are provided by Contra Costa and Alameda counties and by many of the cities within the study area. EBRPD also provides fire services. Table 4.12-1 summarizes the fire services provided.

Table 4.12-1. Fire Services

Agency	Stations	Equipment	Staff	Average Response Times	First Responders to Project Areas
Counties					
Contra Costa County	30 fire stations	District equipment includes 25 wildland fire apparatus, 3 rescue units, a trench rescue area, a fire rescue boat, and a mobile breathing air support area.	Approximately 363 employees	Approximately 5 minutes	Stations at 5755 McBryde Avenue, Richmond, and 6531 San Pablo Dam, El Sobrante, serve the project area.

Table 4.12-1. Fire Services

Agency	Stations	Equipment	Staff	Average Response Times	First Responders to Project Areas
Alameda County	28 fire stations	The ACFD includes 4 battalions, 28 fire stations, 25 engine companies, and 7 ladder truck companies. Other equipment includes heavy rescue vehicle, 3 Zodiac boats, a 2,500-gallon water tender, dozer, and hazardous material response vehicle.	Approximately 404 authorized positions and 80 reserve firefighters	Approximately 5 minutes	Station 5, at 18770 Lake Chabot Road, Castro Valley serves the Lake Chabot Regional Park and Anthony Chabot Regional Park project area.
Cities					
Richmond	7 fire stations	The city has 4 type 1 engines and type IV (grass rig), 2 type 1 engines and ladder truck (105-foot Arial), communications van, 2 hazardous material apparatus, and battalion chief vehicle.	Approximately 90 employees, of whom 84 are sworn officers and 6 are non-sworn personnel	Approximately 6 minutes	Station 63 at 5201 Valley View Road is the closest station to Sobrante Ridge Regional Preserve. Station 66 at 4100 Clinton Avenue is the closest station to the northernmost project areas in Wildcat Canyon Regional Park.
El Cerrito	2 fire stations in El Cerrito; 1 fire station in Kensington which is run by the El Cerrito Fire Department	The city has 6 engines (including El Cerrito and Kensington stations) and 1 cross-staff ladder truck.	Approximately 37 persons in administration and operations	Approximately 4 minutes	Station 72 at 1520 Arlington Boulevard is the closest station to the northern project area in Wildcat Canyon Regional Park. Kensington Fire Protection District Station 65 is close to the southern project area of Wildcat Canyon Regional Park.
Berkeley	7 fire stations	The Berkeley Fire Department has 7 fire stations, 1 drill tower, and administrative offices. The department has 7 engines, reserve engines, trucks, and ambulances.	Approximately 127 sworn personnel	Approximately 4 to 6 minutes	Station 2 at 2029 Berkeley Way serves downtown and the UCB campus area. Station 3 at 2710 Russell Street serves the Claremont Canyon area. Station 7 at 3000 Shasta Avenue is near Tilden Regional Park.

Table 4.12-1. Fire Services

Agency	Stations	Equipment	Staff	Average Response Times	First Responders to Project Areas
Oakland	25 fire stations	The department's fleet includes 25 type 1 engines, 4 type 3 engines, 7 aerial ladders, 8 brush patrols, a fireboat, a heavy-rescue vehicle, 2 foam units, 6 airport rescue rigs, and 4 hose tenders.	Approximately 504 sworn full-time equivalents personnel (FTEs) and 70 civilian FTEs	Response time goal is approximately 7 minutes	Stations 21 and 25 would be the first responders to Leona Canyon Regional Open Space Preserve. Station 25 is at 295 Butters Drive. Station 21 is at 13150 Skyline Boulevard. Station 28 is at 4615 Grass Valley Road and is near the Anthony Chabot Regional Park area.
San Leandro	The ACFD provides services to the City of San Leandro using 4 fire stations formerly operated by the San Leandro Fire Department.	The 4 stations each have an engine and a few have truck companies.	See staff for ACFD above	See response time for ACFD above	ACFD Station 9, at 450 Estudillo Avenue (formerly San Leandro Fire Department, Station 1), serves the Lake Chabot Regional Park and Anthony Chabot Regional Park project area.
Agencies					
EBRPD	10 fire stations, 6 in Alameda County and 4 in Contra Costa County Fire Station 10 in Castro Valley serves as the Fire Department headquarters. Fire Station 1 in East Bay Hills is the Department's main operations station.	Fire stations 1, 5, and 10 house 1 type 3 engine and 1 type 4 engine. Station 1 houses an OES type 1 rescue 3 engine, a type 3 wildland engine, a type 4 wildland engine, and 1 water tender. All other stations house type 4 engines and a second water tender, as needed. Other equipment includes 2 police and fire helicopters and 2 zodiac rescue boats.	14 permanent personnel and approximately 48 industrial firefighters	EBRPD coordinates closely with 20 local jurisdictions. Mutual aid initial attack fire suppression resources would arrive within 10 to 15 minutes from the closest municipal fire department. Response times vary depending on from which station they are dispatched.	First responders would be the closest municipal fire department, county fire department, and Cal Fire engines from the state's closest station(s).

Table 4.12-1. Fire Services

Agency	Stations	Equipment	Staff	Average Response Times	First Responders to Project Areas
UCB	UCB has a mutual aid agreement with the City of Berkeley to assist with the provision of fire and emergency services. In addition, LBNL and the City of Berkeley have an automatic aid agreement.	NA	UCB employs fire marshals who are responsible for fire prevention activities, including fire and life safety inspections of campus buildings for code compliance, fire and evacuation drills, and development of self-help educational materials for use by residence halls and campus departments.	NA	City of Berkeley fire stations that serve the campus area are Station 2 at 2129 Berkeley Way, Station 3 at 2710 Russell Street, and Station 5 at 2680 Shattuck Avenue. The ACFD staffs Station 19 at LBNL Building 48 and is a first responder to calls on the eastern half of the campus.

Sources: Castro 2011; City of Berkeley 2001a and b; City of El Cerrito 2010; City of Oakland 2004; County of Contra Costa 2010; EBRPD 2011a; Kahn/Mortimer Associates 2005; Smith 2011; Williams 2011; UCB 2004; Navellier 2012; Rasmussen 2012.

Notes:
ACFD = Alameda County Fire Department
LBNL = Lawrence Berkeley National Laboratory

Both Alameda and Contra Costa counties have mutual aid agreements with cities near the proposed and connected project areas for fire and emergency services. Contra Costa County has 30 stations and 363 personnel. The City of Richmond has mutual aid agreements for exchange of fire, rescue, and emergency medical services with the Contra Costa County Fire Protection District as well as other jurisdictions. The City of El Cerrito also has automatic response agreements with the Richmond Fire Department and Contra Costa County Fire Protection District that allow for the combined resources of all three agencies to serve the area irrespective of jurisdictional lines. Kensington Fire Protection District is also part of the mutual aid agreement for fire protection services. The City of San Leandro also relies on Alameda County to provide fire services, and UCB is assisted by the City of Berkeley and Alameda County. Alameda County operates 28 fire stations with 484 personnel (404 authorized positions and 80 reserve firefighters). The Oakland Fire Department has primary responsibility for preventing and suppressing fires within the city (City of Oakland 2012). The City of Oakland's Office of Emergency Services coordinates the mutual aid agreements in the city. In addition to general mutual aid agreements, the city has agreements with adjoining jurisdictions for cooperative response to fires. The city also has mutual-response agreements for fire protection with Alameda and Contra Costa counties, EBRPD, and the cities of Alameda, Berkeley, Emeryville, Piedmont, and San Leandro (City of Oakland 2012).

The EBRPD Fire Department provides fire protection and emergency medical services in the East Bay regional parks. The fire services provided by EBRPD include fire prevention and suppression, emergency medical services, response and management of hazardous materials incidents, search and rescue, and resource management and habitat improvement through a

program of prescribed burning, hand crew work, mechanical treatments, and grazing (Rasmussen 2012). EBRPD serves as the first-in responder to designated non-park State Responsibility Area land by contract with California Department of Forestry and Fire Protection (Cal Fire). These calls are typically in remote areas where only 4-wheeled fire apparatus and EBRPD's helicopter have access. EBRPD responds to incidents concurrently with other agencies. Fire response on approximately 29,500 acres of EBRPD parkland in Alameda County is shared with Cal Fire, and fire response on 13,000 acres of parkland within cities is shared with municipal fire departments. Responsibilities are similar in Contra Costa County. EBRPD's response area is both within and adjacent to parklands. In remote areas, primary fire suppression responsibility lies with the Alameda County Fire Department, Contra Costa County Fire Department, or Cal Fire. The EBRPD Fire Department provides secondary wildland fire response in support of Cal Fire (Rasmussen 2012).

The City of Berkeley and Alameda County provide fire protection services to the UCB campus and Lawrence Berkeley National Laboratory (LBNL). In addition, UCB employs fire marshals who are responsible for fire prevention activities, including fire and life safety inspections of campus buildings for code compliance, fire and evacuation drills, and development of self-help educational materials for use by residence halls and campus departments.

4.12.1.3.2 Police Services

Police services are provided by Contra Costa and Alameda counties and the cities within the project area. In addition, EBRPD and UCB have their own police departments. Table 4.12-2 lists the police providers and summarizes their capabilities.

Table 4.12-2. Police Services

Agency	Services	Staff	Beats that Serve the Project Areas
County			
Contra Costa County	The Contra Costa County Sheriff's Department provides police protection for all unincorporated areas of the county.	Approximately 1,074 personnel, consisting of 676 sworn personnel and 398 general employees.	The Sherriff's Office patrols western Contra Costa County via the Bay Station at 5555 Giant Highway, Richmond.
Alameda County	The Alameda County Sheriff's Office provides enforcement services in the county.	The Sheriff's Office has over 1,500 authorized positions, over 1,000 of which are sworn personnel.	The Sherriff's Office patrols the Castro Valley Area via the substation at 15001 Foothill Boulevard. The Emergency Services Dispatch is also in this area.
Cities			
Richmond	The city is divided into 3 geographic districts (North, Central, and South), each of which has its own police captain.	Approximately 187 authorized sworn officers and 34 civilian personnel. Approximately 1.6 sworn officers per 1,000 residents.	Miller/Knox Regional Shoreline is within the Southern District Beat 1. Wildcat Canyon Regional Park and Sobrante Ridge Regional Preserve are in the Northern District Beat 9.
El Cerrito	The City is divided into 3 beats.	Approximately 46 sworn personnel.	The Tilden Regional Park and Wildcat Canyon Regional Park project areas are within Beat 12. The nearest station is at 10900 San Pablo Avenue, El Cerrito.

Table 4.12-2. Police Services

Agency	Services	Staff	Beats that Serve the Project Areas
Berkeley	The city is divided into 18 beats.	Approximately 200 authorized officers and 120 additional staff members for a total of 320 staff. This represented a ratio of 1.8 authorized officers for each 1,000 residents.	Beats 1 and 2 are adjacent to Tilden Regional Park.
Oakland	The department has 57 community policing beats.	Approximately 650 sworn police officers, in addition to reserve officers, cadets, and approximately 350 civilian support personnel.	Beat 13 – Tilden Regional Park, Frowning Ridge-PDM, Claremont-PDM, Claremont Canyon and Sibley Volcanic Regional Preserves, North Hills-Skyline-PDM, Caldecott Tunnel-PDM, Huckleberry Botanic Regional Preserve, Redwood Regional Park Beat 22 – Redwood Regional Park Beat 25 – Anthony Chabot Regional Park, Leona Canyon Regional Open Space Preserve Beat 35 – Anthony Chabot Regional Park
San Leandro	The city is divided into 7 beats.	Approximately 96 authorized officers and 43 civilian staff, about 1.2 sworn officers per 1,000 residents.	Beat 2 is the closest beat to Anthony Chabot Regional Park and Lake Chabot Regional Park.
Other			
EBRPD	Patrols approximately 65 parks.	Peak summer season personnel include approximately 500 persons, including about 150 full-time equivalent employees, more than 60 of which are sworn police officers.	Police headquarters are at Lake Chabot in Castro Valley with substations, including one at the EBMUD San Pablo Reservoir in Orinda.
UCB	The UCB Police Department includes community service officers that promote campus safety and security patrol officers that act as secondary emergency response and ensure the protection of university facilities and enforcement of onsite policies and procedures. The City of Berkeley Police Department provides emergency services to assist the UCPD through a mutual aid agreement.	The UCPD has a staff of 64 officers, 45 full-time civilian personnel and 60 student employees. In 2003, UCPD had a service ratio of 1.2 officers per 1,000 persons.	Not applicable.

Source: Bradley 2011; City of Berkeley 2001a and b; City of Oakland 2004; City of Richmond 2011b and d; County of Contra Costa 2011; EBRPD 2011b; Kahn/Mortimer/Associates 2005; Richmond Police Department 2009; UCB 2011; Wong 2011; Walker 2012.

Notes:
UCPD = UCB Police Department

The Contra Costa County Sheriff's Department provides police protection services for all unincorporated areas of the county. The Alameda County Sheriff's Office provides enforcement services in the county, including Castro Valley. Alameda County's Extended Police Protection County Service Area is administered by the County Sheriff's Office as a dependent special district to supplement funding for police services in the unincorporated area. Local law enforcement in Oakland is the responsibility of the Oakland Police Department. The city's police department is organized into three bureaus, including services, field operations, and investigations. The Bureau of Field Operations includes divisions handling neighborhood services, which includes 57 community policing beats (City of Oakland 2012).

The EBRPD Police Department patrols approximately 65 parks over a 1,750-square-mile area in Alameda and Contra Costa counties (EBRPD 2011a). Peak summer season personnel include approximately 500 persons, including approximately 150 full-time equivalent employees, more than 60 of whom are sworn police officers. Police headquarters are at Lake Chabot in Castro Valley and substations include one at the EBMUD San Pablo Reservoir in Orinda.

The University of California Police Department (UCPD) provides services on the UCB campus. The department is at 1 Sproul Hall. UCPD is responsible for all UCB properties and has jurisdiction within 1 mile around all UCB properties. The City of Berkeley Police Department provides emergency services to assist UCPD through a mutual aid agreement.

4.12.1.3.3 Hospital Services

Several hospitals are within the study area. Emergency facilities are at Doctors Medical Center in San Pablo, Highland Hospital in Oakland, and Summit Medical Center in Berkeley and Oakland. In addition, Falcon Critical Care is at 3508 San Pablo Dam Road in El Sobrante. University Health Services is on Sather Road near Bancroft Way on the UCB campus.

Doctors Medical Center San Pablo, at 2000 Vale Road in the City of San Pablo, is a full service, acute care hospital owned and operated by the West Contra Costa Healthcare District. The Emergency Department is a 24-bed area and is served by an onsite helipad. The Doctors Medical Center is the closest hospital to the cities of Richmond and El Cerrito.

Alameda County Medical Center operates several hospitals, including Highland Hospital, at 1411 East 31st Street, Oakland. Highland Hospital is a 236-bed acute care hospital that serves Alameda County residents. The Emergency Department is the designated trauma center for adults in northern Alameda County.

Summit Medical Center has three facilities in the study area. The Alta Bates Campus at 2450 Ashby Avenue in Berkeley provides emergency services to Berkeley. In 2006, the medical center facilities had 1,094 licensed beds and 79,426 emergency department visits (Alta Bates Summit Medical Center 2007). Summit Medical Center's Summit Campus at 350 Hawthorne Avenue in Oakland provides emergency medical services in Oakland.

Three hospitals are south of Lake Chabot in San Leandro: Fairmont Hospital, 15400 Foothill Boulevard; San Leandro Hospital outpatient rehabilitation facility, 14207 East 14th Street; and Kindred Hospital San Francisco Bay Area, 2800 Benedict Drive.

4.12.1.3.4 Schools

Two public schools are adjacent to proposed and connected project areas: Kensington Hilltop Elementary School and Skyline High School. Skyline High School is in Oakland next to connected project area AC003. The high school is part of the Oakland Unified School District (Skyline High School 2012).

Kensington Hilltop Elementary School is adjacent to proposed project area WC011 in the unincorporated community of Kensington. The school is part of the West Contra Costa County Unified School District (Kensington Hilltop Elementary School Nd.).

4.12.1.3.5 Water

EBMUD provides water service in the study area within Contra Costa and Alameda counties, including the cities of Richmond, El Cerrito, Oakland, Berkeley, and San Leandro. EBMUD's water system serves approximately 1.3 million people in a 331-square-mile area, extending from Crockett to the north, south to Hayward (encompassing the cities of Oakland and Berkeley), and east from San Francisco Bay to Walnut Creek and through the San Ramon Valley (EBMUD Nd.).

4.12.1.3.6 Wastewater

Several municipalities and service districts provide sewer services in the study area. The West County Sanitation District serves the northern half of the City of Richmond, including the vicinity of Sobrante Ridge Regional Preserve and Wildcat Canyon Regional Park. The Richmond Municipal Sewer District provides services in the vicinity of Miller/Knox Regional Shoreline, and the district's wastewater treatment plant is immediately north of Miller/Knox Regional Shoreline (City of Richmond 2011b). The Stege Sanitary District provides services to a portion of Richmond, El Cerrito, and Kensington (unincorporated Contra Costa County), and wastewater is treated by EBMUD. The City of Berkeley owns and maintains sewer mains, and EBMUD treats the discharges. EBMUD provides sanitary sewer treatment services to Oakland, which together with several other communities comprises EBMUD Special District No. 1 sanitary sewer treatment service area. Oakland owns and operates the city's sanitary sewer collection system. The Castro Valley Sanitary District provides and maintains the sewage collection system that serves most of Castro Valley (County of Alameda 2011). The collected sewage is treated by the Oro Loma Sanitary District, which also provides sanitary services to a portion of San Leandro.

4.12.1.3.7 Solid Waste

There are three landfills and four transfer stations in Contra Costa County (County of Contra Costa 2005d). The West Contra Costa County Sanitary Landfill and the West County Integrated Resource Recovery – Central Processing Facility are near the northwestern proposed and connected project areas, northeast of the City of Richmond (County of Contra Costa 2005d).

The Castro Valley and Oro Loma sanitary districts provide garbage collection in the Castro Valley area in Alameda County, including the City of San Leandro (County of Alameda 1985; City of San Leandro 2002). Waste is taken to the Davis Street Transfer Station, west of Interstate 880, outside of the study area. Three landfills are in Alameda County, two operated by Waste

Management and one operated by Republic Services, Inc. None of the landfills are near the proposed and connected project areas (Alameda County Environmental Health 2012).

In the City of Richmond, solid waste and recycling collection is handled by the city, and solid waste is hauled to the Golden Bear Transfer Station (City of Richmond Nd.). In the city of El Cerrito, East Bay Sanitary Company provides garbage collection and hauling services (City of El Cerrito Nd.). The City of Berkeley Department of Public Works, Solid Waste Management Division hauls 80% of the city's solid waste to the city-operated transfer station. The remainder of solid waste in the city is transported to the transfer station by private haulers and individual citizens (City of Berkeley 2001a). Approximately 99% of the refuse taken to the transfer stations ends up in the Vasco Road Landfill, 40 miles from the City of Berkeley (City of Berkeley 2001a). The City of Oakland Facilities and Environment Department, through the Oakland Recycles Program, oversees garbage collection provided by Waste Management of Alameda County and California Waste Solutions (City of Oakland 2012).

On the Hill Campus in and near the Strawberry Canyon-PDM proposed project area, UCB's Physical Plant Services collects nonhazardous solid waste and hauls it to the West Contra Costa County Sanitary Landfill (UCB 2004).

4.12.1.3.8 Energy and Communications

Pacific Gas & Electric (PG&E) provides energy services, including electrical power and natural gas service, throughout the study area. Shell Oil and Kinder Morgan own pipelines that extend through the area (Platts Geospatial Data 2008 and PenWell MAPSearch 2006). Several power transmission lines and natural gas/oil commodity lines extend through the study area. PG&E owns the power transmission lines as well as natural gas pipelines. UCB receives electrical power from two sources: power generated at the campus cogeneration plant and power provided by PG&E to the Hill Area Substation. Both PG&E and UCB own and manage gas distribution lines on campus.

Power transmission lines (<230 kilovolts) extend through the following areas where the proposed and connected actions would occur: Wildcat Canyon Regional Park, Tilden Regional Park, Sibley Volcanic Regional Preserve, Frowning Ridge-PDM, Sobrante Ridge Regional Preserve, Miller/Knox Regional Shoreline, Huckleberry Botanic Regional Preserve, Anthony Chabot Regional Park, Strawberry Canyon-PDM, and Caldecott Tunnel-PDM. In addition, a PG&E natural gas line extends through the vicinity of Claremont Canyon Regional Preserve.

Shell Oil and Kinder Morgan own refined petroleum products pipelines. A Shell Oil refined products line runs southwest-northeast near the border between Sibley Volcanic Regional Preserve and Huckleberry Botanic Regional Preserve. The pipeline passes through one or more of the following project areas: proposed project areas SR005, HP001, and HP002 and connected project areas SR005, SR006, and SR007. A Kinder Morgan refined petroleum product pipeline runs through the industrial area northeast of proposed project area MK005 in Miller/Knox Regional Shoreline.

Communication facilities are on Vollmer Peak in Tilden Regional Park and within the vicinity of North Hills-Skyline-PDM, Sibley Volcanic Regional Preserve, and Redwood Regional Park

(near the West Ridge Trail) project areas. A University of California communications facility is within the vicinity of Strawberry Canyon-PDM.

4.12.2 Recreation

This section discusses recreational facilities and activities in the study area (parks, playgrounds, sports facilities, and trails) based on existing published reports.

4.12.2.1 Regulatory Setting

4.12.2.1.1 State

EBRPD enabling legislation (California Public Resources Code Article 3, 5500 series) states that the EBRPD has the power to "...acquire land...to plan...develop...and operate a system of public parks, playgrounds, golf courses, beaches, trails, natural areas, ecological and open space preserves, parkways, scenic drives, boulevards and other facilities for public recreation, for the use and enjoyment of all the inhabitants of the District...to conduct programs and classes in outdoor science education and conservation education...to employ a police force...prevent and suppress fires...and to do all other things necessary or convenient to carry out the purposes of the District."

4.12.2.1.2 Local

Applicable local regulations and polices pertaining to the project area come from EBRPD, UCB, and Oakland planning documents, as described below.

EBRPD

EBRPD's Master Plan 1997 contains policies for public access and services, park acquisition and development, public participation, human resources, and financial planning (EBRPD 1996). Recreation-related policies address provision and expansion of recreational opportunities, including natural and cultural resources interpretive programs, multi-use trails, picnicking, camping, play areas, and aquatic facilities. Applicable management policies include:

- The District will provide a variety of interpretive programs that focus attention on the region's natural and cultural resources. Programs will be designed with sensitivity to the needs and interests of people of all ages and backgrounds. Programs will enhance environmental experiences and foster values that are consistent with conserving natural and cultural resources for current and future generations to enjoy. The District will pursue and encourage volunteer support to assist in meeting these objectives.
- The District will offer recreational programs and services that appeal to participants of all ages and backgrounds in keeping with its vision and mission. The District will create and manage a comprehensive offering of recreational opportunities, tours, and outdoor skills training that will help visitors use and enjoy the parks and trails and will collaborate with other agencies, organizations, and partners to provide a broad spectrum of regional recreational opportunities.
- The District will provide areas and facilities that serve the recreational needs of park users in accordance with the plans, policies, and park classifications adopted by the

Board or Directors. The District will generally not develop or provide facilities that are more appropriately provided by local recreational and park agencies. Where possible and appropriate, the District will provide multiple-use facilities to serve recreational needs.

- The District will expand its comprehensive trail system by providing more hiking and equestrian narrow trails and more multiple-use paved and unpaved trails. A primary objective will be to provide inter-connecting trails and to link the regional parks through a District-wide system of trails.
- The District will continue to develop group and family picnic facilities throughout the parks system and will continue to improve the reservation system.
- The District will continue to plan, develop, and provide a regional system of aquatic facilities at parks that can support these activities. The District will strive to improve public access to lakes and to the San Francisco Bay and Delta shorelines for boating and fishing and will increase access to swimming beaches.
- The District will continue to plan and develop a balanced system of regional camping facilities, including day camps, group camps, backpack camps, family camps, and residential camps.

UCB

The UCB 2020 Long Range Development Plan (LRDP) contains objectives and policies that address open space and recreational uses (UCB 2005). An objective of the LRDP is to maintain the Hill Campus as a natural resource for research, education, and recreation, with focused development on suitable sites. Policies focus on landscaping and preservation and maintenance of significant views, natural areas, and open spaces. Applicable open space and recreation policies include:

- Ensure the future management of, and investments in, the ecological study area and the botanical garden are integrated and synergetic.
- Maintain the visual primacy of the natural landscape in the hill campus.
- Manage the Hill Campus landscape to reduce fire and flood risk and restore native vegetation and hydrology patterns.

Oakland

Applicable policies in the City of Oakland General Plan Open Space and Recreation Element (City of Oakland 1996) include:

Policy REC-4.1. Provide for ongoing, systematic maintenance of parks and recreational facilities to prevent deterioration, ensure public safety, and permit continued public use and enjoyment.

Policy REC-4.2. Encourage maintenance practices that conserve energy and water, promote recycling, and minimize harmful side effects on the environment. Ensure that any application of chemical pesticides and herbicides is managed to avoid pollution of ground and surface waters.

4.12.2.2 Methodology

The existing recreation resources in the study area were identified based on information provided in general plans, city and county websites, and previously prepared environmental documents for the project areas, including the draft environmental impact report (EIR) for the EBRPD Wildfire Hazard Reduction and Resource Management Plan (WHRRMP EIR) (EBRPD 2009b) and the Draft Environmental Assessment (EA) for Strawberry Canyon (FEMA 2007). Recreational resources are organized by FEMA grant applicant (EBRPD, UCB, and Oakland), and park and recreation facilities are described from north to south. Park visitors and uses are described where user survey data are available.

4.12.2.3 Existing Recreation

Existing recreational resources near the proposed and connected project areas are described below. Table 4.12-3 summarizes the land area, ownership, key features, and recreational resources of each park.

As shown in Table 4.12-3 and described in further detail in the following sections, there are a number of different park types defined by EBRPD and the other jurisdictions in the study area. Park types include (EBRDP 2009b):

- **Regional Park:** A regional park must be 500 acres or more, including land and water. It must have scenic or natural resources in at least 70% of its area. A regional park must have the capacity to accommodate a variety of recreational activities; however, these activities, in a designated Recreation/Staging Unit, may not take place in more than 30% of its area.
- **Regional Preserve:** Regional preserves are further subdivided into four categories: natural, cultural, wilderness, and open space preserves. The primary objective of a regional preserve is to preserve and protect significant natural or cultural resources. A regional preserve must have great natural or scientific importance or be of such significant regional historic or cultural value as to warrant preservation.

  An open space preserve will generally consist of at least 200 acres of undeveloped open space land within or bordering an urban area. An open space preserve may be used for agricultural or for passive recreational activities that do not require substantial facilities or improvements.
- **Regional Shoreline:** A regional shoreline (one area of a group of smaller shoreline areas that are connected by trail or water access) must contain a variety of natural environments and manageable units of tidal, nearshore wetland, and upland areas that can be used for scientific, interpretive, or recreational activities, such as swimming, fishing, boating, or viewing. The Recreational/Staging Unit providing for public access and services may comprise no more than 30% of the regional shoreline.
- **Regional Trails:** Regional trails will connect regional parks or trails to each other; parks and trails of other agencies; areas of unusual scenic beauty; vista points, San Francisco Bay, Delta, or lake shoreline; natural or historic resources; or similar areas of regional significance. Regional trails may also connect regional parks and trails to important

destinations, such as transit centers, schools, colleges, civic centers, other major institutions, employment centers, large commercial complexes, or residential areas.

Table 4.12-3. Parks and Recreational Resources that Could Be Affected by the Proposed and Connected Actions

Park Name	Park Classification	Area Description	Recreational Features
EBRPD			
Miller/Knox	Regional Shoreline	263.4 acres in the City of Richmond. Park contains some of the Potrero Hills (approx. elev. 350 feet); lagoon and landfill area west of the hills.	Paved paths for biking and walking; hiking paths; 9 reservable picnic tables; volleyball areas; horseshoe pits; swimming area; fishing area; showers; restrooms; parking; Golden State Model Railroad Museum
Sobrante Ridge	Regional Preserve	277 acres in the City of Richmond. Natural features include the Manzanita Grove and the Wildlife Refuge Pond.	Hiker, horse, and bicycle trails; Bay Area Ridge Trail; picnic areas; equestrian staging areas; and parking
Wildcat Canyon	Regional Park/Regional Trail	2,197 acres in Contra Costa County. Park area consists of Alvarado Park, Wildcat Canyon, and several tributary canyons bordered by the Berkeley Hills to the west and San Pablo Ridge to the east.	Hiker trails; horse trails; multiple use unpaved and paved trails; Skyline National Trail; reservable and non-reservable picnic tables; horseshoe pits; restrooms; parking
Tilden	Regional Park/Regional Trail	2,077 acres in Contra Costa County.	Paved roads; hiker, horse, and bicycle paths; paved trails for hikers, horses, and bicycles; Skyline National Trail; Bay Area Ridge Trail; swimming; food; reservable and non-reservable picnic tables; visitor center; group camping; parking; restrooms
Claremont Canyon	Regional Preserve	205 acres bordered by UCB Clark Kerr Campus and UCB ecological preserve.	No developed facilities
Robert Sibley Volcanic	Regional Preserve	660 acres at the boundary of Alameda and Contra Costa counties between the cities of Orinda and Oakland.	Mostly undeveloped; 1-lane paved service road used as hiking trail; limited recreational trails within park; parking area
Huckleberry Botanic	Regional Preserve	130 acres on Huckleberry Ridge east of Skyline Boulevard between Oakland and Orinda.	Hiking trails; East Bay Skyline National Recreation Trail; no paved roads or vehicle access within park; parking/staging area at Skyline Boulevard
Redwood	Regional Park	1,831 acres in both Alameda and Contra Costa counties east of Oakland.	12 miles of trails within the park; paved roads (Skyline Boulevard, Redwood Road, and Pinehurst Road); service roads used for hiking and equestrian trails; archery range
Anthony Chabot	Regional Park	4,674 acres in the Oakland and San Leandro Hills, north of Castro Valley.	Hiking, biking, equestrian trails; picnic areas; fishing; boat rentals; and camping areas
Leona Canyon	Regional Open Space Preserve	271 acres in Oakland.	Hiking, biking, equestrian trails; parking
Lake Chabot	Regional Park	315-acre lake and 35 acres of park land in unincorporated Alameda County.	Fishing; golfing; boating; camping; picnicking; hiking; equestrian trails; biking trails; boat rental; marksmanship range; Lake Chabot Public Golf Course; café

Table 4.12-3. Parks and Recreational Resources that Could Be Affected by the Proposed and Connected Actions

Park Name	Park Classification	Area Description	Recreational Features
UCB			
Open Space areas of the Hill Campus, including Strawberry Canyon and Frowning Ridge/Chaparral Hill Preserve	N/A	The ecological study area of the Hill Campus is 300 acres.	No developed recreational facilities; several fire trails; bicycles excluded
Oakland			
North Hills-Skyline/Grizzly Peak Open Space	N/A	68 acres owned by Oakland.	Hiking trails; no developed recreational facilities
Caldecott Tunnel-PDM/ North Oakland Regional Sports Center	N/A	100 acres of city- and state-owned open space on the east side of Highway 24 southwest of the Caldecott Tunnel	Baseball and soccer fields; hiking trails

Source: EBRPD 2009b; Klatt 2012b.

Note: Figures 4.12-1a – 4.12-1g show the location of the parks in proximity to the proposed and connected project areas.

4.12.2.3.1 EBRPD

EBRPD is a state-authorized independent special district that operates 65 parks in Alameda and Contra Costa counties. EBRPD parks span over 112,000 acres and provide over 1,200 miles of trails. Natural amenities and recreational opportunities at the parks include lakes, shorelines, campgrounds, visitor centers, interpretive and recreation programs, picnic areas, rental facilities, and golf courses. The EBRPD proposed and connected project areas include 10 parks in the East Bay Hills and one shoreline park. Recreational resources in the parks and project areas are described below from north to south and shown in Figures 4.12-1a to 4.12-1g.

In 2004 EBRPD surveyed park visitors throughout the park system, including visitors to trails within some of the parks described below. The survey indicated that visitors used the parks for dog walking (34%), hiking (32%), running/jogging (13%), biking (11%), commuting (2%), horseback riding (1%), and other uses (7%). Approximately 47% of visitors surveyed stated their primary reason for selecting a trail was convenience. Other reasons included trail characteristics (20%), aesthetics of the area (13%), trail amenities (2%), and miscellaneous reasons, such as dogs allowed or good terrain (20%). Park visitors are generally local to the area; approximately 24% of visitors live within 1 mile of the park, and 53% of visitors live within 1 to 5 miles (EBRPD 2004).

As part of the WHRRMP, EBRPD staff identified “facilities at risk” from wildfire. Facilities at risk include facilities on EBRPD parklands that are considered highly valuable and include structures and other physical improvements; natural and cultural resources; community infrastructure; and economic, environmental, and social values. Table 4.12-4 summarizes these at-risk facilities.

The following sections describe the EBRPD parks that are in proximity to and/or could be affected by the proposed and connected actions.

Miller/Knox Regional Shoreline

As described in the WHRRMP EIR, the Miller/Knox Regional Shoreline is a 263.4-acre park in the City of Richmond on Point Richmond. Recreational harbor uses are to the east and south, including the Richmond Yacht Club and the Brickyard Cove Marina. Primary access to the park is provided from Dornan Drive via the Garrard Tunnel. The park has four parking areas along Dornan Drive. A paved service road off Crest Avenue extends to Nicholl Knob, and the Crest Trail, an unmaintained paved service road, provides pedestrian access from Canal Boulevard to the park. Park amenities include trails in the hills east of Dornan Drive, a paved bike path around the lagoon, fishing pier, picnic sites, volleyball area, horseshoe pit, and children's play area. Keller Beach, adjacent to the northern end of the park, has a swimming area, picnic area, and showers. The Golden State Model Railroad Museum is also in the park (EBRPD 2009b).

As shown in Figure 4.12-1a, five proposed project areas are in Miller/Knox Regional Shoreline. These areas are toward the northern end of the park and along the southeastern edge. The proposed project areas at the north end of the park are intersected by the Marine View Trail, Crest Trail, and Dornan Grove Trail, which are unpaved hikers-only trails in that area. The proposed project areas along the southeastern edge of the park connect Dornan Drive to Canal Boulevard. These project areas follow the hikers-only West Ridge Trail and a paved section of the Crest Trail on which bikes are not allowed. No connected project areas are in the Miller/Knox Regional Shoreline area.

Sobrante Ridge Regional Preserve

Sobrante Ridge Regional Preserve (Figure 4.12-1b) is in the City of Richmond in Contra Costa County. As described in the WHRRMP EIR, the 277-acre park includes a Manzanita Grove along the western park boundary and the Wildlife Refuge Pond in the southeastern corner of the park. The preserve has 2.5 miles of ridgetop trails accessible from three points: the Coach Drive staging area, an equestrian staging area, and a parking area along Heavenly Ridge Lane. The trail system connects to trails in Pinole Valley Park. Benches and picnic tables along the trail provide views of the hillsides (EBRPD 2009b).

As shown in Figure 4.12-1b, a proposed project area is in Sobrante Ridge Regional Preserve. The project area is in the Manzanita Grove. A 0.12-mile loop trail (Manzanita Loop) within the Manzanita Grove is partially within the proposed project area. This trail is an unpaved hiking and horse trail. Other nearby trails and recreational facilities include the Sobrante Ridge Trail, Manzanita Trail, and picnic benches (EBRPD 2009b).

Local parks in the vicinity of Sobrante Ridge Regional Preserve include Rain Cloud Park and Lamoine Park in the City of Richmond (See Figure 4.12-1b) (City of Richmond 2011c).

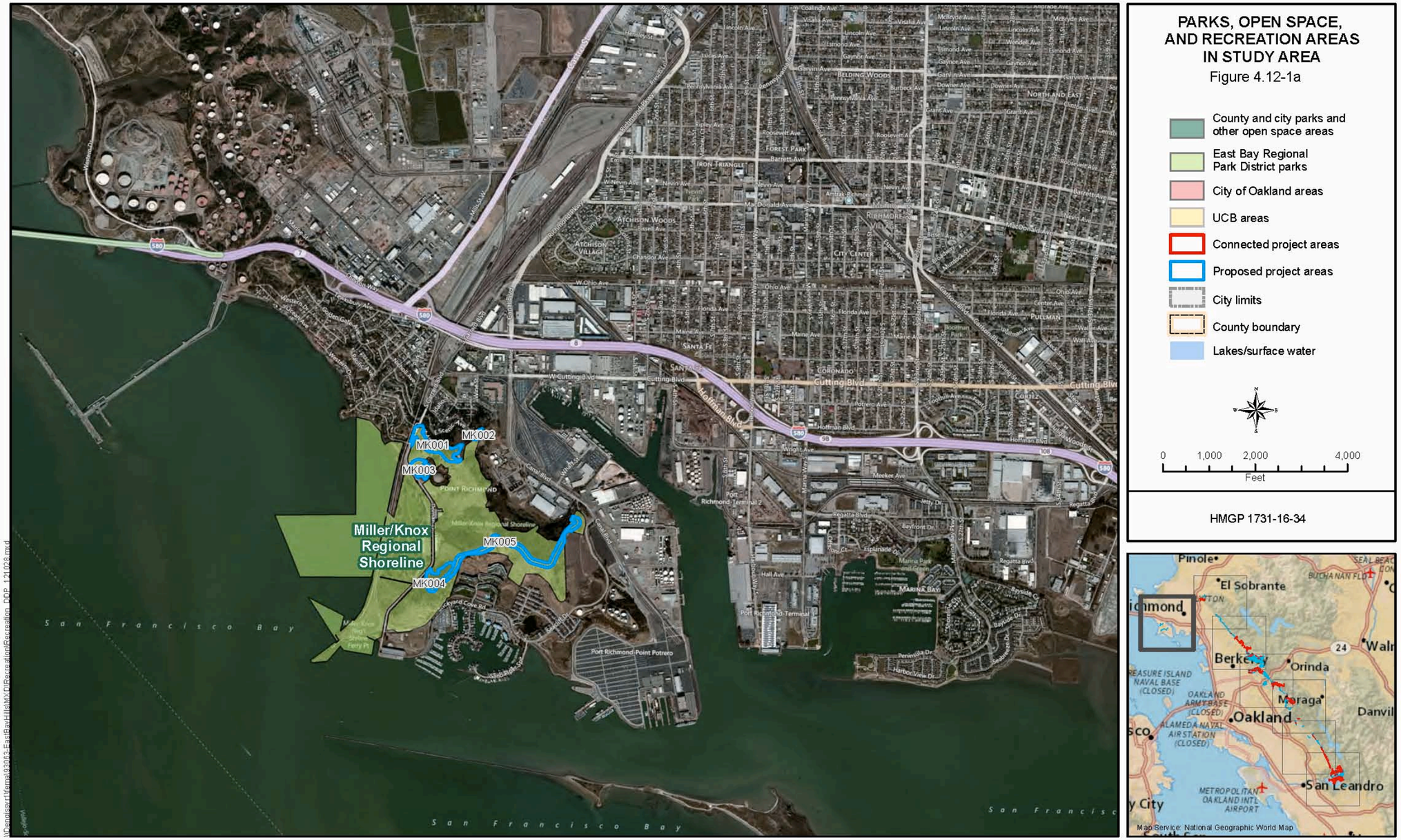

Figure 4.12-1a. Parks, Open Space, and Recreation Areas in the Proposed and Connected Project Areas

Figure 4.12-1b. Parks, Open Space, and Recreation Areas in the Proposed and Connected Project Areas

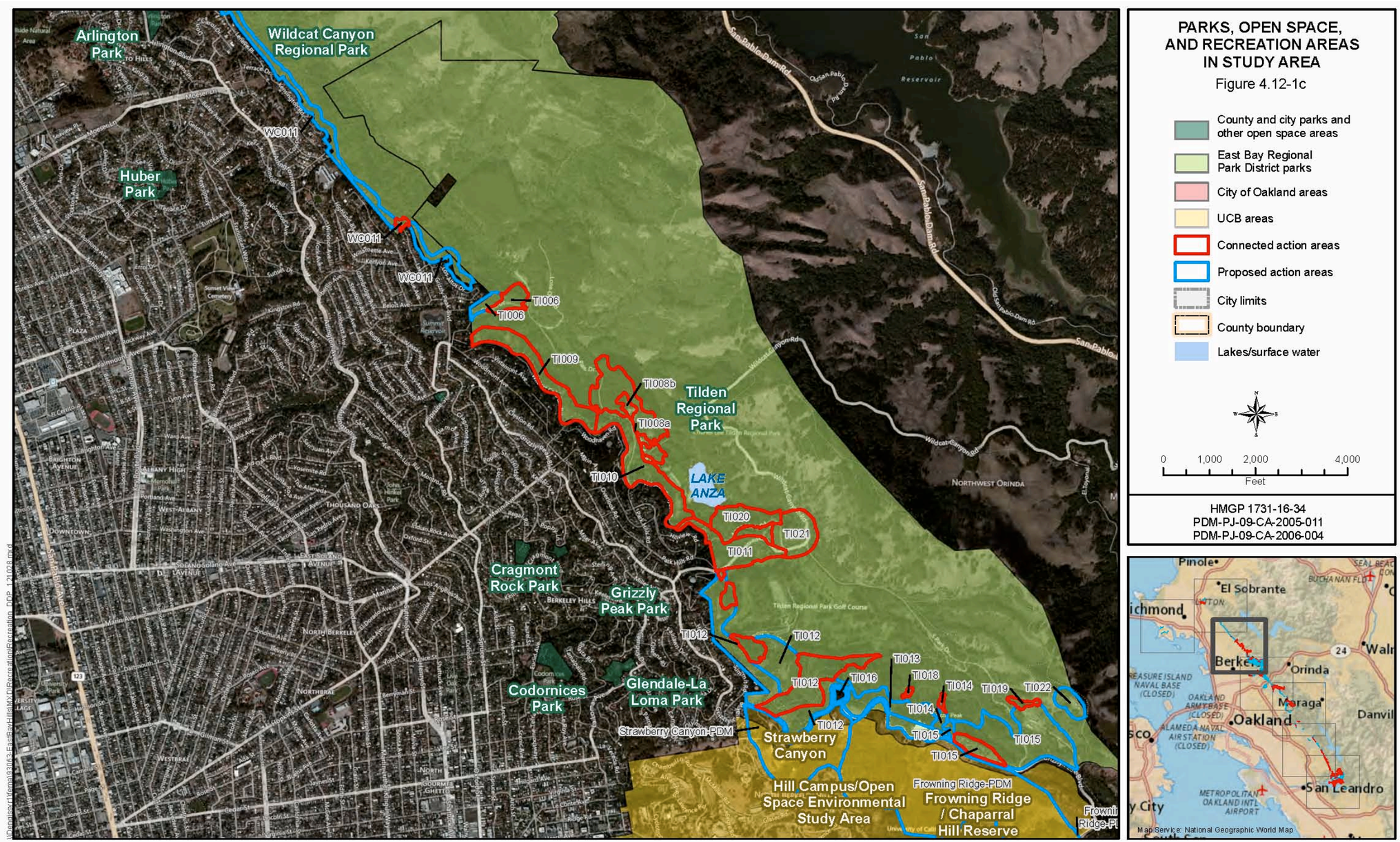

Figure 4.12-1c. Parks, Open Space, and Recreation Areas in the Proposed and Connected Project Areas

Figure 4.12-1d. Parks, Open Space, and Recreation Areas in the Proposed and Connected Project Areas

Figure 4.12-1e. Parks, Open Space, and Recreation Areas in the Proposed and Connected Project Areas

Figure 4.12-1f. Parks, Open Space, and Recreation Areas in the Proposed and Connected Project Areas

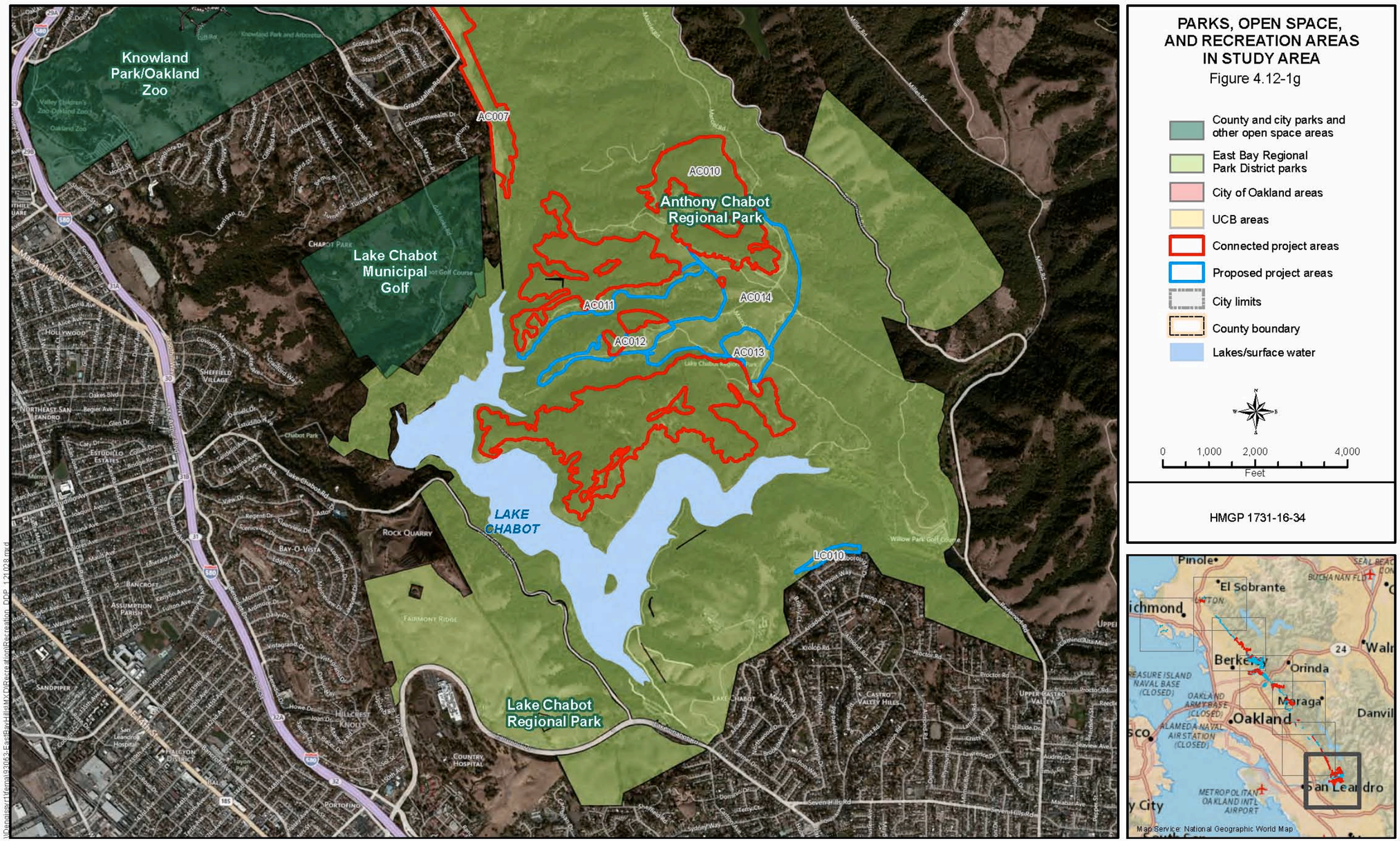

Figure 4.12-1g. Parks, Open Space, and Recreation Areas in the Proposed and Connected Project Areas

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Table 4.12-4. Developed Facilities at Risk from Wildfire

Facility Name	Facility Type	Proposed, Connected, and Cumulative Project Area
Kennedy Grove Regional Recreation Area		
Fern Cottage	Building	KG003
Kennedy Grove Park Office and Service Yard	Building	KG003
Wildcat Canyon Regional Park		
Alvarado Office/Service Yard	Building	WC005
Tilden Regional Park		
Wildcat View Group Shelter (WCC)	Camp	TI002a
Environmental Education Center Complex and Residence	Building	TI002a
New Woodland Camp Shelter	Camp	TI002a
Merry-Go-Round Complex/Residence and Bathroom	Building	TI008b
Tilden Corp Yard and Residence	Building	TI015
Golden Gate Live Steamers Clubhouse/Train Facilities	Building	TI015
Steam Trains Bathroom/Roundhouse and Facilities	Building	TI015
Botanic Garden	Garden	TI021
Pony Ride Complex	Equestrian	
Lake Anza Complex/Concession/Residence	Building	
Brazil Building and Residence	Building	
Tilden Golf Course Facility	Building	
Tilden Golf Course Maintenance Structures	Building	
Gillespie Group Camp	Camp	
Claremont Canyon Regional Preserve		
Gelston Street Field Offices/Park Office	Building	CC008
Temescal Regional Recreation Area		
Temescal Bathing Facility	Bath House	TM001
Temescal Park Office and Restrooms	Building	
Sibley Volcanic Regional Preserve		
Park Residence	Building	SR005
Sibley Visitors Center	Building	SR005
Sibley Office/Shop/Park Residence	Building	
Redwood Regional Park		
Redwood Skyline Gate Residence	Building	RD001
Girls' Camp Shelter and Picnic Area	Camp	RD003
Archery Range	Building	RD005b
Redwood Bowl Residence	Building	RD005b
Park Residence	Building	RD006
Park Office	Building	RD006
Concession, Swim Complex	Building	RD006
Trudeau Center	Building	RD008
Stable	Equestrian	RD009
Redwood Stables Residence	Building	RD009
Redwood Schoolhouse	Building	RD010
Fire Station #2	Building	RD010
Chabot Space and Science Center	Building	
Redwood Park Entrance Residence	Building	
Office/Garage/Service Yard	Building	
Anthony Chabot Regional Park		
Chabot Equestrian Center	Equestrian	AC007
Marksmanship Water Tank	Water Tank	AC010
Group Camp - Hawk Ridge Shelter	Camp	AC011
Skyline Ranch Stables	Equestrian	
Marksman Range, Residence, Office	Building	
Service Yard, Park Residence, Kiosk	Building	
Willow Park Golf Course Structure	Building	

Table 4.12-4. Developed Facilities at Risk from Wildfire

Facility Name	Facility Type	Proposed, Connected, and Cumulative Project Area
Anthony Chabot Regional Park		
Public Safety Headquarters, Nike Classroom, and Park Office	Building	
Lake Chabot Residence/Marina/Cafe	Building	
South County Yard	Building	
Point Pinole Regional Shoreline		
Point Pinole Park Office and Corporate Yard	Building	
Miller/Know Regional Shoreline		
Golden State Railroad Museum & Office Park	Building	

Source: EBRPD 2009b.

Wildcat Canyon Regional Park

Wildcat Canyon Regional Park (shown on Figures 4.12-1b and 4.12-1c) encompasses approximately 2,197 acres in Contra Costa County. As described in the WHRRMP EIR, the park area includes Alvarado Park, Wildcat Canyon, and several tributary canyons bordered by the Berkeley Hills to the west and the San Pablo Ridge to the east. The majority of trails within the park are unpaved multi-use trails used as service roads for maintenance and fire protection and as hiking and equestrian trails. Approximately 4 miles of trails are paved, including Nimitz Way (2.3 miles). There is no private vehicle access along Nimitz Way. Gates at various points throughout the park prevent vehicle access. The northwest corner of the park is known as the Alvarado Area and contains restrooms, picnic areas, a children's play area, and the Wildcat Canyon Staging Area. The only structure within the park, apart from restrooms, is the park office (EBRPD 2009b).

Proposed and connected project areas are in two portions of the park. Two contiguous connected project areas include most of Alvarado Park. Two proposed project areas extend northeast of Alvarado Park, including the trails that access the park from Monte Cresta Avenue and Bonita Road. These trails are unpaved hiking, horseback riding, and bicycle trails. The remainder and majority of the proposed and connected project areas in Wildcat Canyon Regional Park would extend along the western edge of the park (west of Wildcat Creek Trail) from the Mira Vista Golf and Country Club (Figure 4.12-1b) to the south end of the park, east of Los Altos Drive (Figure 4.12-1c). The project areas would extend over Rifle Range Road Trail.

A connected project area is near the intersection of Lake Drive and the Fire Trail. Other local parks and open space areas near the project areas at Wildcat Canyon include Hillside Natural Area (Figure 4.12-1b), Arlington Park, and Huber Park (both on Figure 4.12-1c) (City of Richmond 2011c).

Tilden Regional Park

Tilden Regional Park (Figure 4.12-1c) is approximately 2,077 acres in Contra Costa County. As described in the WHRRMP EIR, Tilden has a variety of recreational facilities, including a steam train (near proposed project areas TI013, TI014, TI015, and TI016 and connected project areas TI014, TI018, and TI019), an 18-hole golf course (near connected project areas TI011, TI020, and TI021), a botanic garden (also near connected project areas TI011, TI020, and TI021), and a

merry-go-round (near connected project areas TI010 and TI008a). Additional features include the Tilden Nature Study Area and Little Farm in the northern portion of the park. Picnic facilities are throughout the western and southern areas of the park. Group camping and equestrian camping facilities are also within the park. Lake Anza offers swimming and shower facilities (EBRPD 2009e). In addition, the Golden Gate Live Steamers large-scale miniature steam train is in proposed project area TI015, and the Indian Camp playground is adjacent to the connected project area TI006.

The park contains approximately 20 miles of hiking and equestrian trails and approximately 13 miles of service roads. Four miles of trails and service roads are paved and connect to adjacent areas, including Wildcat Canyon Regional Park. Several paved roads allow vehicular access within the park, including South Park Drive, Wildcat Canyon Road, Canyon Drive, and Central Park Drive. An estimated 2,500 parking spaces are in the park. These include 1,600 formal parking stalls and 900 informal roadside spaces.

Several proposed and connected project areas are in Tilden Regional Park. These are designated by labels beginning with TI in Figures 3.4-1 through 3.4-10 in Section 3. From the north, along Canon Drive between Wildcat Canyon Road and Central Park Drive, there would be a proposed project area, and directly north of this there would be a connected project area. Extending south from Canon Drive along Wildcat Canyon Road and Central Park Drive, there also would be connected project areas. These connected project areas would extend to the east over Central Park Drive and continue south all the way to the intersection of Shasta Road and Selby Trail. Proposed project areas also would extend south in the vicinity of Tilden Regional Park Golf Course and southeast along Golf Course Road and Grizzly Peak Boulevard. There would be some connected project areas in this vicinity near South Park Drive and Grizzly Peak Boulevard. The majority of the proposed and connected project areas in this location are north of Golf Course Drive and Grizzly Peak Boulevard, extending south of Grizzly Peak Boulevard's intersection with Lomas Cantadas, which is north of the UCB Campus.

Recreational resources in the project area include a portion of the Wildcat Creek Trail, Selby Trail, Grizzly Peak Trail, Vollmer Peak Trail, Seaview Trail, and Tower Trail. Wildcat Creek Trail (unpaved) and Seaview Trail (paved) are open to hikers, horses, and bicycles. The other trails are unpaved hiking and horse trails. Park amenities in the project areas include the "Native Here" Nursery (in proposed project area TI012), three parking lots, restroom facilities, drinking water facilities, three information centers, horse water facilities, and picnic areas.

Local parks and open space in this area include Codornices Park, Dorothy Bolte Park, Cragmont Park, Remillard Park, Grizzly Peak Park, and Glendale La Loma Park (Figure 4.12-1c) (City of Berkeley 2011).

Claremont Canyon Regional Preserve

Claremont Canyon Regional Preserve (Figure 4.12-1d) is in the City of Berkeley in Alameda County. As described in the WHRRMP EIR, the 205-acre preserve is bordered by UCB's Clark Kerr Campus to the west and the UC ecological preserve to the north and east (EBRPD 2009b). A fire trail extends along Panoramic Ridge; however, there are no developed facilities within the

preserve. The preserve is accessible from Stonewall Road, Dwight Way, Panoramic Way, and Grizzly Peak Boulevard.

Proposed and connected project areas are throughout Panoramic Hill to the north of Claremont Avenue. The area extends over a portion of the Stonewall-Panoramic Trail and Gelston Way. This area of Panoramic Hill is known for the panoramic views to the west of the Bay and San Francisco beyond. There also would be a connected project area that extends south of Claremont Avenue and extends to Grizzly Peak Boulevard.

Sibley Volcanic Regional Preserve

Sibley Volcanic Regional Preserve (Figure 4.12-1d) is a 660-acre park at the boundary of Alameda and Contra Costa counties between Oakland and Orinda. Sibley Volcanic Regional Preserve is largely undeveloped and has an extinct volcano known as Round Top as its most prominent feature (EBRPD 2009b). A 1-lane paved service road runs from the parking area to the summit of Round Top. This road is also used as a hiking trail. Limited recreational trails are found within the park. Paved access to the park entrance is provided by Skyline Boulevard, immediately south of its intersection with Grizzly Peak Boulevard. Parking for 10 to 12 cars is provided off of Skyline Boulevard.

Proposed project areas extend along Grizzly Peak Boulevard and Skyline Boulevard on both sides of the Caldecott Tunnel segment of State Route 24. Connected project areas are on both sides of Skyline Boulevard and Grizzly Peak Boulevard in the general vicinity of the intersection between those two roads. Connected project areas include a triangular area west of Thorndale Drive referred to as the Sibley Triangle.

Trails near the proposed and connected project areas include the Skyline National Trail/Bay Area Ridge Trail, a partially paved trail for hikers and horses. Other recreational facilities in the project area include a parking lot, restrooms, and a visitor center.

Huckleberry Botanic Regional Preserve

Huckleberry Botanic Regional Preserve (Figures 4.12-1d and 4.12-1e) is a 130-acre area on Huckleberry Ridge east of Skyline Boulevard and Oakland. The East Bay Skyline National Recreation Trail traverses the preserve. Except for a parking and staging area at Skyline Boulevard, there are no paved roads or vehicle access within the park (EBRPD 2009b).

Proposed project areas in Huckleberry Botanic Regional Preserve are contiguous with proposed and connected project areas in the eastern portion of Sibley Volcanic Regional Preserve to the north. The proposed project areas extend along the north side of homes on the north side of Skyline Boulevard and include parts of the Huckleberry Path, an unpaved path for hikers only, and small segments of the Skyline National Recreation Trail, an unpaved trail for hikers and horses. Recreational facilities in the project area are primarily along Skyline Boulevard and include a parking lot, restroom facilities, and a visitor information center.

Redwood Regional Park

Redwood Regional Park (Figures 4.12-1d, 4.12-1e, and 4.12-1f) is in Alameda and Contra Costa counties east of Oakland. As described in the WHRRMP EIR, the 1,831-acre park has

approximately 12 miles of trails, and its principal features include a redwood forest, canyons, and open rolling ridges. Picnic locations and restrooms are provided off the trails. Paved roads serving the park include Skyline Boulevard, Redwood Road, and Pinehurst Road. Approximately 17 miles of service roads are used for maintenance, fire protection, and hiking and equestrian trails. Four staging areas within and adjacent to the park provide parking and access to trails. Piedmont Stables is in the western part of the park and is a private boarding stable. An archery range is in the northwestern portion of the park (EBRPD 2009b).

Proposed project areas extend from the Skyline Gate Staging Area along the western park boundary to the Redwood Bowl Staging Area just east of Chabot Space and Science Center. The work in proposed project areas RD005a and RD005b is intended to reduce hazardous fire risk at the center. Additional proposed and connected project areas are along several trails extending southeast into the park from near Pine Hills Drive, including the East Ridge Trail, the Phillips Loop Trail, and the Stream Trail.

Additional proposed and connected project areas surround EBRPD headquarters and the Piedmont Stables in the southern section of the park. EBRPD headquarters are in connected project area RD008. The Piedmont Stables are in proposed project area RD009, adjacent to connected project area RD009.

The proposed and connected project areas would include a portion of the Skyline National Recreation Trail/West Ridge Trail (bicycles permitted) and the Tres Sendas trail (hikers and horses) as well as several recreational facilities, including two parking lots, restroom facilities, a visitor information center, and an archery range (EBRDP 2009b). A portion of the project area would extend over Golden Spike Trail (hikers only) and Tate and Monteiro trails (hikers and horses).

Anthony Chabot Regional Park

Anthony Chabot Regional Park (Figures 4.12-1f and 4.12-1g) is a 4,674-acre park in the hills east of Oakland and San Leandro and north of Castro Valley. As described in the WHRRMP EIR, a variety of amenities are provided throughout the park, including hiking, biking, and equestrian trails; picnic areas; fishing; boat rentals; and camping areas. The park contains 37.5 miles of unpaved service roads, 40 miles of trails, and 4.5 miles of paved roads serving the marina and the family and group camps. Lake Chabot Road, Marciel Road, Skyline Boulevard, and Redwood Road provide access to the park (EBRPD 2009b).

Proposed and connected project areas are in three distinct sections of the park. Four small project areas are near the northwestern end of the park. Of those four, three are on the north and south sides of the Skyline Ranch Equestrian Center, which is on the east side of Redwood Road just north of Skyline Boulevard. The fourth project area in this group is half a mile east on the east side of Oakland’s Skyline High School.

In the second of the three sections, proposed and connected project areas extend south along the Goldenrod Trail (east of Skyline Boulevard) from near Knoll Ridge Way to Oakland’s Lake Chabot Golf Course. Project areas along the western park boundary would include parts of the Ranch and Horseshoe trails (hikers and horses only), and Buckeye Trail (hikers only). In this

section of the park, proposed and connected project areas AC007 contain the Chabot Equestrian Center.

The third section includes proposed and connected project areas in the interior of the park north of Lake Chabot (Figure 4.12-1g). The project areas in this section contain paved access roads such as Marciel Road and unpaved hiker, horse, and bike trails, including Brandon/Bay Area Ridge and Live Oak trails, both part of the Lake Chabot Bicycle Loop, as well as Quail, Redtail, and Two Rocks trails. Other trails include Towhee Trail (hikers and horses). Campgrounds in or near the project areas include Hawk Ridge, Two Rocks, Lookout Ridge, Lost Ridge, El Venado, and the Lake Chabot Family Campground. This section of the park also includes a marksmanship range at the Chabot Gun Club, the Willow Park Public Golf Course, and the Willow Park Event Center. Connected project area AC010 wraps around the gun club facilities.

Other local parks, open space, and recreation areas in the vicinity of Anthony Chabot Regional Park include Leona Heights, Knowland Park, and the Oakland Zoo (Figure 4.12-1f).

Leona Canyon Regional Open Space Preserve

As described in the WHRRMP EIR, the 271-acre Leona Canyon Regional Open Space Preserve (Figure 4.12-1f) is within a wooded canyon and includes hiking, equestrian, and bike trails. Parking is provided off Canyon Oaks Drive, and the park can be accessed from Skyline Boulevard and Campus Drive (EBRPD 2009b). The proposed project area would extend over a portion of the Artemesia Trail, which is accessible to hikers, horses, and bicycles.

Lake Chabot Regional Park

Lake Chabot Regional Park is a 315-acre lake in unincorporated Alameda County. The lake serves as a standby emergency water supply and uses of the lake are restricted to preserve the purity of the water. Parking and staging areas are along Redwood Road, Skyline Boulevard, and Lake Chabot Road. Activities at the park include fishing, boating, camping, picnicking, hiking, horseback riding, and bicycling. The park consists of several hundred acres and contains over 20 miles of trails, a boat rental facility, a marksmanship range, a café, and campground facilities.

The park contains one proposed project area designated LC010. It is east of Lake Chabot behind homes on Hillsborough Drive. It would include parts of the Cameron Loop and Ten Hills trails (hikers, horses and bicycles).

4.12.2.3.2 UCB

UCB manages 29 acres of developed recreational space, including athletic fields and recreational facilities on campus and in the campus vicinity (UCB 2005). The primary recreation complex, which includes gymnasiums, pools, tennis courts, and athletic fields, begins on the north side of Bancroft Way east of Barrow Lane and continues along Centennial Drive into the Hill Campus.

UCB's proposed project areas are within the Hill Campus, as designated in the UCB Long Range Development Plan. The developed UCB recreation facilities in the Hill Campus are referred to as the Strawberry Canyon Recreation Area, which extends along Centennial Drive. Facilities in this area include Levine-Fricke Softball Field, Witter Rugby Field, Strawberry Canyon Pool, a ropes course, locker rooms, a barbecue and picnic area, and the Haas Clubhouse. All of these facilities

are at least 0.4 miles from the nearest proposed or connected project area, Strawberry Canyon-PDM.

Undeveloped recreation areas on the Hill Campus include the 300-acre Ecological Study Area, Faunal Refuge, Botanical Garden, research open space buffers, and the Frowning Ridge/Chaparral Hill and Claremont Canyon Reserve Study Areas. The lands within the Ecological Study Area are generally undeveloped and preserved for education and research. Land within the Frowning Ridge/Chaparral Hill and Claremont Canyon Reserve Study Areas is currently undeveloped but is designated for possible limited future development (Figures 4.12-1c and 4.12-1d).

The proposed project areas on UCB property are in the Hill Campus. They include Strawberry Canyon-PDM, Frowning Ridge-PDM, and Claremont-PDM. Frowning Ridge-PDM roughly corresponds to the Frowning Ridge/Chaparral Hill Reserve Study Area. Roughly the eastern half of Frowning Ridge-PDM is in the Ecological Study Area. Claremont-PDM roughly corresponds to the Claremont Canyon Reserve Study Area. Frowning Ridge-PDM and Claremont-PDM are undeveloped, and Strawberry Canyon-PDM is partially developed. All three areas are used for instruction and research related to the natural environment.

The Upper and Lower Jordan Fire Trails are the main unpaved access roads into the Hill Campus and provide recreational access (Klatt 2012b). The Upper Jordan Fire Trail passes through Strawberry-Canyon-PDM and Frowning Ridge-PDM, and a branch off the Upper Jordan Fire Trail passes through Claremont-PDM to Claremont Avenue. Several secondary fire roads are in steeper terrain and are maintained to lower standards but still enable pedestrian access. Trails connect the Hill Campus to adjacent Tilden Regional Park. The Hill Campus open space areas are used primarily by students and local residents for walking, hiking, running, jogging, and dog walking. Additional recreational and educational uses include nature study and wildlife viewing. Many points within the Hill Campus offer magnificent views of San Francisco Bay and the Golden Gate Bridge.

UCB does not have a formal mechanism for tracking recreational users of its lands (Klatt 2012b). The open space areas of the Hill Campus are not developed with restrooms, formal parking facilities, or other amenities to accommodate heavy recreational use (Klatt 2012b). A small number of unofficial parking spaces are available near fire road intersections with Grizzly Peak Boulevard, Claremont Avenue, and Centennial Drive. In addition, parking is allowed in UCB lots near the Space Sciences Lab in the Strawberry Canyon-PDM proposed project area after work hours and on weekends without charge. Trail parking and employee parking is limited to about 12 parking spaces near the entrance to the Lower Jordan Fire Trail (Klatt 2012b).

4.12.2.3.3 Oakland

Oakland has 2,942 acres of parkland in more than 130 parks. The city provides a range of recreational opportunities, including boating, swimming, athletic fields, gymnasiums, and gardening. The two Oakland parks within the proposed and connected project areas are described below. The North Hills-Skyline-PDM area is connected to the adjacent EBRPD parks and is used primarily by local residents for walking, hiking, running/jogging, and dog walking. Visitors to the Caldecott Tunnel-PDM area come to the park primarily for the athletic fields.

North Hills-Skyline-PDM

The Oakland Open Space and Recreation Element designates most of the North Hills-Skyline-PDM proposed project area as Grizzly Peak Open Space for resource conservation purposes (Figure 4.12-1d) (City of Oakland 1996). The Open Space and Recreation Element defines this area as a 58-acre park acquired for open space preservation and recommends replacement of invasive species with native species to reduce fire hazards. The Open Space and Recreation Element proposes a trail to connect the area to Claremont Canyon, Skyline Regional Trail, and the North Oakland Sports Center.

Caldecott Tunnel-PDM (North Oakland Regional Sports Center)

The Caldecott Tunnel-PDM area is at the 51-acre North Oakland Regional Sports Center, which provides approximately 6 acres of athletic fields. Several trails extend through the park.

4.13 Land Use and Planning

This section describes existing and proposed land uses in and adjacent to the proposed and connected project areas as a baseline for assessing how the proposed and connected actions and no action alternative could affect these uses. This section discusses relevant planning documents and existing and planned land uses as documented in existing general plans.

4.13.1 Regulatory Setting

Local jurisdictions regulate land use in the proposed and connected project areas through their general plans, which provide goals and policies to guide current and long-term development in their communities. As required by California law, each city and county must adopt a general plan for areas within its planning boundaries, as well as adjacent land outside of a city's boundaries that may be considered in its sphere of influence. Under state law, the goals, policies, and implementation measures in the general plan are mandatory, and any land use approvals made by planning commissions and boards of supervisors must conform to the general plan.

The land use element of the general plan describes existing land uses in the jurisdiction and outlines goals and policies to achieve the community's vision for current and future development in the area. The following sections describe the land use policies and goals for each jurisdiction in the proposed and connected project areas, including Alameda and Contra Costa counties and the cities of Oakland, Berkeley, Richmond, and El Cerrito. In addition, UCB and EBRPD have development plans that guide land use on their lands in the project areas.

4.13.1.1 Alameda County General Plan

Portions of the proposed and connected project areas in Alameda County are in the cities of Berkeley and Oakland, as well as unincorporated areas of the county. The cities of Berkeley and Oakland have general plans that provide land use goals and policies for their communities, and are discussed further below. The Alameda County General Plan is discussed in this section and provides goals and policies for unincorporated areas that overlap the project areas.

The Alameda County General Plan consists of three plans with land use elements specific to unincorporated communities and geographic areas: the Castro Valley General Plan, the Eden Area General Plan, and the East County Area Plan.

4.13.1.2 Castro Valley General Plan

The Castro Valley General Plan was adopted in 1985 and is currently being updated. A draft general plan was completed in January 2007 and was revised in July 2010 to incorporate new proposals and changes in programs since the 2007 draft (County of Alameda 2010). The southernmost proposed and connected project areas overlap the Castro Valley planning area.

In contrast to the 1985 general plan, the new draft general plan reflects the passage of Measure D, a voter-approved initiative that amended the county's general plan to establish an urban growth boundary limiting urban development in most of the rural areas of the county. The new draft general plan focuses on the urbanized portion of the Castro Valley planning area to guide infill development inside the urban growth boundary.

The Land Use and Development Element contains policies that will guide future development in Castro Valley over the next 20 years, focusing on smaller infill development projects specific to certain neighborhoods and districts. The main goal of the element is to allow infill housing and add new retail, restaurants, services, and employment while preserving the small town character of the area.

4.13.1.3 Contra Costa County General Plan

Many of the proposed and connected project areas are in western Contra Costa County, which is adjacent to and north of Alameda County. The West County area covers project areas in the cities of Richmond and El Cerrito, the unincorporated communities of Hasford Heights and Kensington, and several EBRPD parks. Specific land use goals and policies for the cities of Richmond and El Cerrito are provided in the respective general plans. The Contra Costa County General Plan includes goals and policies for the unincorporated communities.

The Contra Costa County General Plan was adopted in January 2005 and outlines goals, policies, and implementation measures to guide land use decisions through 2020 (County of Contra Costa 2005b). The Land Use Element includes policies and designations largely shaped by a voter-approved initiative, Measure C-1990, which establishes an urban limit line. The purpose of the urban limit line is to ensure preservation of nonurban agricultural, open space, and other areas by establishing a line beyond which no urban land uses can be designated during the term of the general plan.

In addition, the urban limit line facilitates enforcement of the 65/35 Land Preservation Standard, which limits urban development in the county through the term of the general plan to no more than 35% of the land in the county. The standard requires that at least 65% of all land in the county be preserved for agriculture, open space, wetlands, parks, and other nonurban uses.

The Land Use Element includes land use policies for Hasford Heights and Kensington, unincorporated communities adjacent to proposed and connected project areas. The project areas near the Hasford Heights neighborhood are shown as overlapping the Sobrante Ridge Regional Preserve and Briones Hills areas in the general plan (County of Contra Costa 2005b).

Land use policies for the Sobrante Ridge Regional Preserve area apply to the proposed project area near the Sobrante Ridge. Policies for the Sobrante Ridge Regional Preserve area aim to retain and reinforce the semirural and suburban character of the community by emphasizing single-family residential land uses and restricting development of ridgelines.

A policy for the Briones Hills area states that land in the Briones Hills Agriculture Preservation Area will not be annexed for urban development. This rural area includes large properties owned by East Bay Municipal Utility District (EBMUD) and EBRPD that are designated “Watershed” and “Parks and Recreation” on the general plan land use map. The remaining properties are used primarily for grazing cattle and are designated as “Agricultural Lands.” This Contra Costa County General Plan anticipates that the area will remain in public and agricultural use during the planning period.

The Contra Costa County General Plan land use policies for the Kensington area seek to preserve views of scenic natural features and built features (bridges, skylines). In addition, policies will include the review for new residential development for design compatibility, privacy, and sunlight on surrounding neighborhoods.

4.13.1.4 City of Oakland General Plan

The City of Oakland General Plan was adopted in March 1998 and includes policies to balance citywide and individual neighborhood needs (City of Oakland 1998). The Land Use and Transportation Element of the general plan includes policies and strategies to meet challenges faced by the city in the first decades of the 21st century. The element focuses on economy and employment, population and housing, transportation, and a livable and sustainable City of Oakland (Oakland).

The Land Use and Transportation Element designates land areas for expansion of industrial, retail, and other businesses in the city while concentrating certain types of retail and commercial businesses into activity centers and near major transportation corridors (City of Oakland 1998). The element aims to accommodate population increases through addition of residential units, the bulk of which are anticipated to be along major corridors, downtown, and infill in established neighborhoods.

The Land Use Element divides the city into six planning areas. Proposed and connected actions would occur in two of these areas, designated as the North Hills-Skyline-PDM. Due to the particular concerns of development in the hillsides, such as steep slopes and community character, two area plans for portions of the hills were prepared in the 1970s—The North Oakland Hills Area Specific Plan and the Shepherd Canyon Plan—which provide the basis for zoning amendments and open space, remaining consistent with the general plan.

The Land Use Element describes the 1991 firestorm area, which consumed over 2,700 dwellings, and the rebuilding effort. Oakland’s recovery from this fire is largely complete, with some rehabilitation of historical buildings still in process in the downtown area. During general plan development, North Hills residents identified additional clean-up needed, such as removing dead trees and remaining foundations. Residents of the area indicated that fire safety is of primary concern in the community (City of Oakland 1998).

4.13.1.5 UCB 2020 Long Range Development Plan

The UCB 2020 Long Range Development Plan includes an outline of planned land use and capital investments to meet academic goals and objectives for the university through 2020 (UCB 2005). The Claremont-PDM, Frowning Ridge-PDM, and Strawberry Canyon-PDM, which total 284 acres, are in the UCB Hill Campus, an area of approximately 1,000 acres reaching from Stadium Rim Way east to Grizzly Peak Boulevard. The plan includes an objective to “maintain the Hill Campus as natural resources for research, education, and recreation, with focused development of suitable sites” (UCB 2005).

The plan recognizes that development in this area of the campus should be limited because of the existing value of the land for scenic and recreational uses, fire risk in the area, steep terrain and

limited access to the area, and physical separation of the Hill Campus from the remaining portions of the campus. For the most part, the Hill Campus is dedicated to research, open space, and reserve areas. It includes a 300-acre ecological study area that includes most of the 185-acre Frowning Ridge-PDM. Current plans are to expand this ecological study area and to preserve the area for education and research. The plan also includes goals to limit any actual development of this area to educational purposes, and to ensure that any development is conducted with careful consideration of the surrounding landscape.

The plan also addresses a section of the Hill Campus designated the Claremont Canyon Regional Preserve study area. This area is east of the ecological study area, on the west side of Grizzly Peak Boulevard. It includes the eastern end of the Frowning Ridge-PDM and all of the Claremont-PDM. The 2020 Long Range Development Plan states that potential uses of this area include faculty housing and a campus retreat center, but that more promising near-term options exist for both faculty housing and conference facilities, and that these options must be fully explored before development of the Claremont Canyon Regional Preserve study area is given serious consideration (UCB 2005).

The plan includes specific policies to manage fire risk in the Hill Campus area, including vegetation management to reduce fuel loads, favoring species with lower fuel content, and separating vegetation clusters as well as understory and crown fuels. The plan favors ultimate eradication of invasive non-native species and restoration of native grassland and oak woodland but states that this must be done with consideration of impacts to wildlife habitat.

4.13.1.6 City of Richmond General Plan

The City of Richmond General Plan was last updated in 1994 and is in the process of being updated again. A public review draft of the most recent Richmond General Plan 2030 was completed in February 2011 (City of Richmond 2011a). The draft general plan takes into account the growth and revitalization that Richmond has experienced over the past several years and incorporates the concepts of sustainability, smart growth, and transit-oriented development as guiding principles for development.

The city is divided into planning areas. The planning areas that overlap the proposed and connected project areas are the El Sobrante Valley, which includes a portion of Wildcat Canyon Regional Park and the neighborhood of Hasford Heights, and the Southern Shoreline, which includes Miller/Knox Regional Shoreline. The general plan's Land Use and Urban Design Element defines goals and policies focused on compact development to achieve a more sustainable environment. The element aims to provide vibrant urban corridors, active public spaces, and enhanced neighborhood character.

Specific land use goals, policies, and actions outlined in the plan reflect Richmond's intent to:

- Enhance environmental quality
- Support the recreation and tourism industry
- Create mixed-use development in the southern shoreline area
- Protect and enhance cultural and natural resources along the Richmond Shoreline
- Preserve, enhance, and restore natural and open space resources in the city

- Create resources and amenities, preserve cultural resources, and encourage economic growth along the waterfront
- Develop an open space plan to enhance public open space areas

4.13.1.7 City of Berkeley General Plan

The City of Berkeley General Plan was last updated in July 2001 and documents the community's long-range priorities and values to guide public decision-making in the future. While the city is required to abide by the general plan's goals and policies, UCB and other state and county agencies operating in Berkeley are not legally obligated to comply with the plan (City of Berkeley 2001a). However, the plan encourages cooperation between agencies as a way to benefit all stakeholders involved in community decisions. UCB's planning policies are also outlined in its 2020 Long Range Development Plan, discussed previously in this section (UCB 2005).

The general plan has several broad objectives, including preserving Berkeley's character and quality of life, protecting local and regional environmental quality, and creating a sustainable Berkeley. One goal that specifically relates to the proposed and connected actions is to make Berkeley a disaster-resistant community. This goal recognizes that potential hazards, such as earthquakes, fires, and landslides, may affect the community and that there is a need to consider these hazards in future development and to reduce the vulnerability of existing structures.

The general plan's Land Use Element also has several objectives, one of which is to "minimize the negative impacts and maximize the benefits of the UCB on the citizens of Berkeley" (City of Berkeley 2001a). The Land Use Element includes several additional policies and action items that relate to the city's relationship with UCB and aim to develop a working relationship between the city and UCB to support mutually beneficial land uses and shared facilities.

The general plan's Open Space Element also has several objectives, one of which is to "Preserve, maintain, and repair the city's existing open space and recreational resources and facilities" (City of Berkeley 2001a). The Open Space Element includes a policy that promotes coordination with regional open space agencies, such as the EBRPD, neighboring cities, and private section and nonprofit institutions to maintain, improve, and expand the region's open space.

4.13.1.8 City of El Cerrito General Plan

The El Cerrito General Plan was last updated in August 1999 and documents the city's desire to improve the balance of residential, commercial, and civic uses in the city through 2020 (City of El Cerrito 1999). The two priority issues the general plan addresses are maintaining the city's high-quality single-family residential areas in terms of design and compatibility with other areas and paying for maintenance of parks, public services, and facilities by increasing the city's tax base.

The plan's Community Development and Design Chapter includes the Land Use, Community Design, Housing, and Growth Management elements. The chapter discusses the city's urban development pattern, a series of north-south bands from the San Francisco Bay lowlands on the west to the Wildcat Canyon ridge tops to the east. The proposed and connected actions would occur near the eastern edge of the city in Wildcat Canyon Regional Park. The chapter includes a

policy to preserve and enhance the city's well-defined edges along hillside open spaces and along the edge of Wildcat Canyon Regional Park. Several proposed project areas are in the park adjacent to El Cerrito.

4.13.1.9 EBRPD Master Plan

EBRPD prepared an update to its 1997 master plan, which will describe EBRPD's priorities and plans for future expansion of parks, trails, and services for at least the next decade (EBRPD 1996). The EBRPD Master Plan aims to guide stewardship and development of current and future parks while maintaining a balance between natural resource conservation and recreational use. The new 2012 draft master plan was completed in early 2012, and EBRPD received public input on the draft through meetings, survey, focus groups, and other community outreach events. (EBRPD 2012d). EBRPD staff will consider these comments with the preparation of the revised draft master plan. The comments will be addressed in the "Response to Comments" document that will be appended to the EBRPD Revised Draft Master Plan, which is currently being developed.

The 1997 master plan divides the district into three planning areas: West Metropolitan Sector, South Metropolitan Sector, and Diablo Sector (EBRPD 2012d). The EBRPD proposed and connected project areas are in the West Metropolitan Sector, which extends from San Pablo Bay to the south side of Lake Chabot and from San Francisco Bay into the East Bay Hills. According to the master plan, EBRPD will continue to allocate resources based on the populations projected for each sector. EBRPD works actively with other jurisdictions to monitor the activities of the neighboring cities and counties, identify mutual goals, and protect its interests.

The master plan also includes land use designations and planning and management guidelines to ensure that parkland development is consistent with EBRPD's mission (EBRPD 2012d). All district parks are categorized into the following classifications: open space preserve, regional park, regional preserve, regional recreation area, regional shoreline, and regional trail. The Planning and Management Guidelines relate to the general development of trails and facilities in park areas and also include specific guidelines for each category of park.

For development and management activities in park areas, EBRPD follows a planning process that includes public participation, compliance with applicable laws, and analysis of natural resources and public use objectives. As part of this process, EBRPD develops land use plans (LUPs) to obtain public comments about potential development and management activities in an entire park. The LUP is a long-range plan that evaluates park resources, recommends management and resource conservation programs, and includes proposals for future facilities. The LUP process also includes review by a citizen-based Park Advisory Committee, a public meeting to discuss the draft LUP, and a public hearing prior to the EBRPD Board of Directors adopting the plan. EBRPD issued a draft Wildcat Canyon Regional Park/Alvarado Staging Area LUP Amendment in 2011 that covers multiple projects intended to improve parking and circulation in the Alvarado Park Recreation/Staging Area and along adjacent residential streets. The work described in the LUP amendment would occur in and near connected project area WC005.

EBRPD also adopts systemwide plans, when appropriate, to guide land use and management of parklands in the entire two-county area (Alameda and Contra Costa counties). Currently, no other LUPs and no systemwide plans apply to the proposed and connected project areas except for the Wildfire Hazard Reduction and Resource Management Plan adopted in April 2010 (EBRPD 2009b).

The Wildfire Hazard Reduction and Resource Management Plan provides long-term strategies for reducing fuel loads and managing vegetation within EBRPD's Study Area parks (EBRPD 2009b). The Wildfire Hazard Reduction and Resource Management Plan is consistent with the master plan and builds upon EBRPD's ongoing fuels management activities as well as other EBRPD plans and policies. This plan has a number of goals, including reducing fire hazards on EBRPD-owned lands in the East Bay's wildland-urban interface to an acceptable level, maintaining and enhancing ecological values for plant and wildlife habitat consistent with fire reduction goals, providing aesthetic landscape values for park users and communities, and providing a vegetation management plan. The vegetation management program identifies and describes the various vegetation types within the Study Area and their associated fuel characteristics, outlines fire hazard reduction and resource management goals, and identifies potential fuel treatment methods.

4.13.2 Methodology

Existing land use and applicable land use plans, policies, and regulations were identified based on information in general plans and city websites. The study area for land use and planning covers the jurisdictions where the proposed and connected actions would be implemented: the cities of Richmond, El Cerrito, Berkeley, and Oakland; unincorporated communities in Alameda and Contra Costa Counties; and lands managed by UCB and EBRPD.

4.13.3 Existing Conditions

4.13.3.1 Existing Land Use

The "East Bay" is a common informal term that refers to the lands on the eastern side of San Francisco Bay. The region includes Alameda and Contra Costa counties.

The East Bay region has grown to include not only the urbanized shoreline along the San Francisco Bay but also the hillsides and ridges east of the shoreline communities and more distant inland valleys.

The proposed and connected actions would occur in the East Bay Hills and in Miller/Knox Regional Shoreline. The East Bay Hills are the ridges and hillsides that separate the urbanized shoreline from the less developed inland valleys. The majority of the East Bay Hills is open space adjacent to single-family residential communities. Land uses in the proposed and connected project areas are described in more detail below. Most of the descriptions are organized by county and city, but separate descriptions are provided for land uses near Redwood Regional Park and Wildcat Canyon Regional Park because they fall within multiple government jurisdictions.

4.13.3.1.1 Alameda County

Alameda County occupies most of the East Bay region of the Bay Area. San Francisco Bay borders the county to the west, and the peaks of the East Bay Hills form part of the northeastern boundary and extend into the center of the county. In Alameda County, the proposed and connected project areas are in open space lands in the cities of Oakland and adjacent to Berkeley and the unincorporated community of Castro Valley.

Anthony Chabot Regional Park

The 5,067-acre Anthony Chabot Regional Park is an EBRPD park in unincorporated Alameda County. The park provides opportunities for hiking, riding, biking, and camping. The East Bay Skyline National Trail, which traverses 31 miles of the East Bay Hills from Richmond to Castro Valley, runs the length of the park.

Many proposed and connected project areas are in Anthony Chabot Regional Park. The largest project areas are north of Lake Chabot near campgrounds and a marksmanship range operated by the Chabot Gun Club but not adjacent to any residential communities.

Other proposed and connected project areas in the park are adjacent to residential neighborhoods and other land uses along Skyline Boulevard in Oakland, including Skyline High School, the Skyline Ranch Equestrian Center, Redwood Ranch, the Oakland Stables, and the Chabot Equestrian Center.

Lake Chabot Regional Park

Proposed and connected project area LC010 is adjacent and to the north of Castro Valley in Lake Chabot Regional Park. This project area runs along the border of a residential neighborhood in Castro Valley. The park is accessible from the adjacent residential neighborhood.

The Castro Valley General Plan Existing Land Use Map shows that existing land uses adjacent to the proposed project area are Residential (0 to 8 dwelling units per acre), Vacant, and Public/Institutional (County of Alameda 2010). The Castro Valley General Plan Existing Zoning Map shows that existing zoning is R-1 (Single Family District) with variations in site area and yard requirements and R-1 with conditional secondary unit. Lake Chabot Regional Park is shown as being outside of the Castro Valley zoning boundaries (County of Alameda 2010).

4.13.3.1.2 Contra Costa County

Contra Costa County is generally divided into three planning areas: West County, Central County, and East County. Many of the proposed and connected project areas are in West County, which includes portions of the shorelines of San Francisco Bay and San Pablo Bay and is separated from the rest of the county by the Briones Hills and the watersheds owned by EBMUD. In the West County area, proposed and connected project areas are on EBRPD-managed lands in the cities of El Cerrito and Richmond, adjacent to the unincorporated communities of Kensington and Hasford Heights, and in EBRPD parks east of Berkeley and Oakland.

Kensington

Kensington is largely residential. The cities of Berkeley and Albany are adjacent to the south, El Cerrito is to the west and north, and Wildcat Canyon Regional Park and Tilden Regional Park are adjacent to the east. Proposed and connected project areas are in these parks along the eastern border of Kensington.

Hasford Heights

Hasford Heights is an unincorporated community in Contra Costa County and is surrounded by Wildcat Canyon Regional Park to the south and east. The City of San Pablo is to the north and west, and the City of Richmond is also to the east. Proposed project areas are immediately east of Hasford Heights and Alvarado Park. Alvarado Park is a section of Wildcat Canyon Regional Park south of Hasford Heights and is a connected project area.

Tilden Regional Park

Tilden Regional Park is a 2,079-acre EBRPD park east of Berkeley that provides opportunities for camping, hiking, biking, golfing, horseback riding, picnicking, swimming in Lake Anza, nature walks through the botanic garden, merry-go-round rides, visits to the Environmental Education Center and the Little Farm, and steam train rides along the scenic ridgeline. Many of the proposed and connected project areas are in Tilden Regional Park. Adjacent land uses include single-family residential neighborhoods and UCB facilities in Strawberry Canyon.

Huckleberry Botanic Regional Preserve

Huckleberry Botanic Regional Preserve is a 241-acre preserve that contains a unique native plant community that is found only in specific soil and climatic conditions along the California coast. The preserve provides trails for nature walks, hiking, and horseback riding (EBRPD 2012c). Proposed project areas in the preserve are adjacent to the Hills Swim Club and Tennis Club as well as residential neighborhoods.

4.13.3.1.3 Redwood Regional Park

Redwood Regional Park is an EBRPD park in Alameda and Contra Costa counties that also includes a connected project area in Oakland. The 1,829-acre park contains the largest natural stand of coast redwood remaining in the East Bay region. The park includes picnic sites, group day and overnight camping areas, and trails for hiking, jogging, and horseback riding. Proposed and connected project areas in Contra Costa County extend along the east side of Skyline Boulevard adjacent to single-family homes in Oakland, and extend along trails into the park. Project areas in Contra Costa County are adjacent to the Chabot Space and Science Center, a fire station, Oakland's Joaquin Miller Park, and the Skyline Gate entrance to the Stream Trail. Project areas in unincorporated Alameda County include the Piedmont Stables and are adjacent to a single-family residential area south of Balmoral Drive and the Skyline Ranch Equestrian Center on the northeast side of Redwood Road. Connected project area RD008 is in Oakland and contains an EBRPD office building.

4.13.3.1.4 Sibley Volcanic Regional Preserve

Most of EBRPD's Sibley Volcanic Regional Preserve is in unincorporated Contra Costa County, and Oakland. The preserve includes the remains of a 10-million-year old volcano called Round Top, one of the area's highest peaks (EBRPD 2012e). The 31-mile East Bay Skyline Trail crosses the preserve, and several other trails provide opportunities for hiking, biking, and horseback riding. The preserve is adjacent to Oakland's Grizzly Peak Open Space and Huckleberry Botanic Regional Preserve. Proposed and connected project areas in the preserve extend along Grizzly Peak Boulevard and Skyline Boulevard, near single-family residential areas.

A proposed and connected project area referred to as the Sibley Triangle is in Oakland. It extends south on the west side of Thorndale Drive, between two mainly single-family residential areas. Oakland has zoned the Sibley Triangle as an open space resource conservation area (City of Oakland 2011b).

4.13.3.1.5 Wildcat Canyon Regional Park

Wildcat Canyon Regional Park is an EBRPD park in Richmond and unincorporated Contra Costa County adjacent to El Cerrito. The park consists of 2,430 acres along Wildcat Creek and the surrounding hillsides. The park extends from Tilden Regional Park in the south to the north end of Richmond and provides opportunities for picnicking, hiking, mountain biking, and horseback riding.

Several proposed and connected project areas in Wildcat Canyon Regional Park are on the steep slope along the eastern boundary of Kensington adjacent to a neighborhood of single-family homes. Kensington Elementary School is also in this neighborhood and is adjacent to proposed project area WC011.

The adjacent communities to the west in Kensington are shown as SH (Single-Family Residential – High) with 5.0 to 7.2 units per net acre on the Contra Costa County General Plan Land Use Map and are classified as R6-TOV-K (Single-Family Residential – Lot Size 6,000-square-foot minimum plus Kensington and Tree Obstruction of View Ordinance Combining Districts) on the Contra Costa County Zoning Map (County of Contra Costa 2007).

The Richmond portion of the project area is in the Wildcat Canyon Regional Park and is designated on the City of Richmond's land use and zoning maps as Parks and Recreation and Community and Regional Recreational District (City of Richmond 2011a).

Additional proposed and connected project areas in Wildcat Canyon Regional Park are in the City of Richmond adjacent to the single-family residential community of Hasford Heights north of Alvarado Park. Hasford Heights is partially in the City of Richmond and partially in unincorporated Contra Costa County. Alvarado Park includes connected project areas WC005 and WC006. Richmond has zoned the proposed and connected project areas in Alvarado Park and adjacent to Hasford Heights for recreation (City of Richmond 2011a).

4.13.3.1.6 Oakland

Oakland is a major port on San Francisco Bay. Oakland is centrally located in the East Bay region and is the county seat of Alameda County. The Oakland General Plan divides the city into six planning areas to provide a more detailed description of different parts of the city and to describe local issues and priorities for each area (City of Oakland 1998). Proposed and connected actions would occur in two of these planning areas, designated as the North Hills-Skyline-PDM.

Leona Canyon Regional Open Space Preserve

Leona Canyon Regional Open Space Preserve is a 290-acre parkland near Merritt College in the South Hills area of Oakland. The park provides opportunities for hiking, running, biking, and dog walking. Merritt College is north of the preserve. Proposed project area LE005 is in the eastern section of the preserve. A residential neighborhood off Skyline Boulevard is adjacent to this project area. Leona Canyon Regional Open Space Preserve is designated as a resource conservation area and zoned as open space on the City of Oakland General Plan and Zoning Map (City of Oakland 2010).

North Oakland Regional Sports Center

The North Oakland Regional Sports Center is on the east side of State Route 24 southwest of the Caldecott Tunnel. The sports complex includes a baseball and soccer field with surrounding undeveloped hillsides. The Caldecott Tunnel-PDM proposed project area includes the sports center. Adjacent land uses to the east and south are residential.

Oakland has zoned the North Oakland Regional Sports Center as an open space resource conservation area and an open space athletic field (City of Oakland 2011b).

Grizzly Peak Open Space

Grizzly Peak Open Space is an undeveloped area along Grizzly Peak Boulevard north of the west entrance to the Caldecott Tunnel. It borders Sibley Volcanic Regional Preserve to the east and a single-family residential area in Oakland to the west. Grizzly Peak Open Space is the North Hills-Skyline-PDM proposed project area.

Grizzly Peak Open Space is zoned as an open space resource conservation area with special requirements for extra review of any proposed development to ensure preservation of scenic views and other open space values (City of Oakland 2012).

Claremont Canyon Regional Preserve

Claremont Canyon Regional Preserve is a 208-acre preserve in Oakland on both sides of Claremont Avenue. The preserve is undeveloped and reserved primarily for hiking Trails in the preserve connect with UCB’s trail system to the north. The majority of Claremont Canyon Regional Preserve is included in proposed and connected project areas. Adjacent land uses include a UCB housing complex west of the preserve, additional residential neighborhoods to the south and northwest, and additional open space to the north and east. Oakland has zoned Claremont Canyon Regional Preserve as an open space resource conservation area.

Strawberry Canyon, Claremont Canyon, and Frowning Ridge

Strawberry Canyon, Claremont Canyon, and Frowning Ridge are in the UCB Hill Campus, which extends from the UCB football stadium east to Grizzly Peak Boulevard. Part of Strawberry Canyon is sparsely developed with UCB facilities, and the rest is undeveloped. Lawrence Berkeley National Laboratory is southwest of Strawberry Canyon and a residential area is to the northwest. Claremont Canyon and Frowning Ridge are entirely undeveloped and are adjacent to other undeveloped areas. Strawberry Canyon, Frowning Ridge, and a portion of Claremont Canyon are proposed project areas (Strawberry Canyon-PDM, Frowning Ridge-PDM, and Claremont-PDM).Oakland has designated all three areas as a resource conservation area and zoned them hillside residential, low density (City of Oakland 2011a and 2011b).

4.13.3.1.7 City of Richmond

The City of Richmond extends from San Francisco Bay and San Pablo Bay east into Wildcat Canyon Regional Park. It surrounds the City of San Pablo and the unincorporated communities of North Richmond, El Sobrante, East Richmond Heights, and Hasford Heights. The city is a residential suburb of San Francisco but also includes heavy industrial and commercial areas.

Sobrante Ridge Regional Preserve

The Sobrante Ridge Regional Preserve is a 277-acre area that preserves the habitat of the Alameda Manzanita, a rare plant species. The preserve provides opportunities for hiking, dog walking, horseback riding, hillside picnics, bird watching, biking on approved trails, and naturalist programs. Proposed project area SO001 is on the western edge of the preserve, adjacent to a single-family residential neighborhood. This project areas is designated as open space and zoned as a community regional recreational district (City of Richmond 2011a).

Miller/Knox Regional Shoreline

The 307-acre Miller/Knox Regional Shoreline in Richmond includes a landscaped picnic area, a swimming beach in a secluded cove, a fishing pier, views of the North Bay area, and a model railroad museum. Five proposed and connected project areas are in Miller/Knox Regional Shoreline, which is adjacent to two residential neighborhoods and close to the city wastewater treatment plant. Other surrounding land uses include industrial, commercial, and office. The proposed and connected project areas in Miller/Knox Regional Shoreline are designated for parks and recreation and zoned as a community regional recreational district (City of Richmond 2011a).

4.13.3.1.8 City of Berkeley

The City of Berkeley is north of Oakland and south of the unincorporated community of Kensington. The city is the home of UCB and the Lawrence Berkeley National Laboratory. None of the proposed and connected project areas is in the City of Berkeley. Residential neighborhoods in Berkeley are adjacent to proposed and connected project areas in Tilden Regional Park and Claremont Canyon Regional Preserve. The UCB campus in Berkeley is adjacent to the Strawberry Canyon-PDM and to proposed and connected project areas in Claremont Canyon Regional Preserve.

4.13.3.1.9 City of El Cerrito

The City of El Cerrito is known for the El Cerrito Plaza, a large shopping center, and the Cerrito Theater, a restored movie theater that offers full dining in the theater. Albany and Kensington are adjacent to the south, the Richmond Annex is to the west, East Richmond Heights is to the north, and Wildcat Canyon Regional Park is to the east. No proposed or connected project areas are in the city, but several proposed and connected project areas in Wildcat Canyon Regional Park are adjacent to low-density residential neighborhoods at the city's eastern border.

4.13.3.2 Planned Land Use and Growth

The EBRPD Draft 2012 Master Plan describes EBRPD's priorities and plans for future expansion of parks, trails, and services for at least the next decade (EBRPD 2012d). In addition, land use plans are being developed for individual parks in the EBRPD system to evaluate park resources, recommend management and resource conservation programs, and identify future improvements. Several of these plans are currently being developed, but none have been approved.

In general, EBRPD and other agencies with jurisdiction over portions of the project area intend to maintain or expand recreational and open space areas; therefore, existing recreational and open space land uses in and adjacent to the project area will likely remain the same, or expand, in the future. Planned future land uses in and adjacent to the proposed and connected project areas are similar to the existing uses. These uses mostly consist of developed residential neighborhoods and public facilities and are expected to remain as such.

4.13.3.3 Growth Trends

Existing planning documents for Contra Costa County, Alameda County, UCB, and the cities of Oakland, Richmond, Berkeley, and El Cerrito were reviewed to identify growth trends in the East Bay Hills. Because of the built-out condition of the East Bay region, future growth near the proposed and connected project areas is anticipated to occur primarily in the form of infill development, and no major changes in existing land uses are anticipated.

Additional residential development is expected to occur primarily through replacement of existing housing or subdivision of existing residential properties. Residential and commercial infill is also expected to occur in some downtown areas and along major transportation corridors. Growth trends in each individual jurisdiction are discussed in more detail below.

4.13.3.3.1 Alameda County

Castro Valley

The Castro Valley General Plan anticipates that the population in Castro Valley will grow 18.4% between 2005 and 2025 but that this growth can be accommodated without major changes to land use or permitted densities (County of Alameda 2007). According to the general plan, residential development is expected to occur primarily through subdivision of existing residential lots in the upper and lower hillside areas and infill in the downtown area and multi-family neighborhoods surrounding I-580. Some commercial infill is also anticipated in the downtown area.

The proposed and connected project area in Castro Valley is in Lake Chabot Regional Park, which is used for recreation. Future improvements in the park would accommodate existing and planned uses and are not expected to result in population growth in the area. The neighborhood adjacent to the project area is designated for single-family residential use, with a range of between 4 and 8 dwelling units per acre. There is some potential for subdivision of these lots and construction of additional residential units, but this is not expected to result in a substantial amount of growth in this area.

4.13.3.3.2 Contra Costa County

Kensington and Hasford Heights

The Contra Costa General Plan estimates that in Contra Costa County as a whole the population will grow 18.9% between 2000 and 2020. Population data from the U.S. Census Bureau indicate that the county's population has already grown approximately 10.5% between 2000 and 2010 (from 948,816 in 2000 to 1,049,025 in 2010) (U.S. Census Bureau 2012). According to the general plan, a high amount of new and infill development is anticipated; however, the type and amount of anticipated growth varies substantially among different areas of the county (County of Contra Costa 2005b). The amount of growth in smaller, unincorporated areas like Kensington and Hasford Heights is expected to be much lower and to consist primarily of infill development.

The proposed and connected project areas adjacent to the Kensington community are in the Tilden Regional Park and Wildcat Canyon Regional Park, and the Hasford Heights community is adjacent to Wildcat Canyon Regional Park. Future improvements in the park would accommodate existing and planned uses but are not expected to result in population growth in the area. Because the existing and designated land uses adjacent to the project area are residential, there is some potential for subdivision of these lots and construction of additional residential units, but this is not expected to result in a substantial amount of growth in this area.

4.13.3.3.3 Oakland

The City of Oakland General Plan estimated that the city's population would grow approximately 6.5% between 1995 and 2015, and a large amount of additional housing was needed to accommodate this increase and replace housing lost during the 1989 earthquake and 1991 firestorm (City of Oakland 1998). Population data from the U.S. Census Bureau indicate that the city's population grew approximately 4.9% between 1990 and 2010 (from 372,242 in 1990 to 390,724 in 2010) (U.S. Census Bureau 2012). According to the general plan, additional commercial development is planned, but both commercial and residential development is expected to be concentrated along transportation corridors as infill development. Future improvements in the proposed and connected project areas and Oakland would accommodate existing and planned uses and are not expected to result in significant population growth.

The existing and designated land uses in Oakland adjacent to the project areas are primarily residential, recreational, and institutional (Skyline High School). There is some potential in these areas for subdivision of lots and construction of additional residential units, but this is not expected to result in a substantial amount of growth.

4.13.3.3.4 City of Richmond

The City of Richmond General Plan estimates that the city's population will grow approximately 25% between 2010 and 2030 (City of Richmond 2011a). Commercial, industrial, and residential growth is planned for the city through infill development along key corridors and mixed-use development but with a high level of open space preservation. Future improvements in the proposed and connected project areas in Richmond would accommodate existing and planned uses but would not be expected to result in population growth.

The existing and designated land uses adjacent to the proposed and connected project areas are primarily residential. There is some potential for subdivision of these lots and construction of additional residential units, but this is not expected to result in a substantial amount of growth. A portion of the surrounding land uses in Miller/Knox Regional Shoreline is industrial and commercial, largely associated with the port. Growth in the waterfront area, primarily through infill development, is being encouraged.

4.13.3.3.5 City of Berkeley

Between 1970 and 2000, Berkeley's population decreased slightly while the number of housing units increased slightly. Population data from the U.S. Census Bureau indicate that the city's population grew approximately 9.5% between 1990 and 2010 (from 102,724 in 1990 to 112,580 in 2010) (U.S. Census Bureau 2012). However, housing is in high demand because of growth at UCB and growth in local employment. Vacant land in the city is very limited, so any additional housing units are expected to be developed as infill projects along major corridors and downtown.

Berkeley is adjacent to proposed and connected project areas in Strawberry Canyon-PDM, Claremont Canyon Regional Preserve, and Tilden Regional Park. Future improvements in these areas would accommodate existing and planned uses but would not be expected to result in population growth in Berkeley. Adjacent land uses in Berkeley are primarily single-family and multi-unit residential, open space, and recreational, with a portion of the Claremont Canyon Regional Preserve abutting UCB's Clark Kerr Campus. There is some potential for subdivision of these lots and construction of additional residential units, but this construction is not expected to result in a substantial amount of growth in this area. Future development of UCB's campus may result in some growth in or adjacent to the project area.

4.13.3.3.6 City of El Cerrito

The City of El Cerrito General Plan projects that land use patterns will remain largely the same through 2020 because of the built-out nature of the city (City of El Cerrito 1999). Population data from the U.S. Census Bureau indicate that the city's population decreased by approximately 1.6% between 2000 and 2010 (from 23,171 in 2000 to 23,549 in 2010) (U.S. Census Bureau 2012). Additional development is expected to be through infill, with most of the residential and commercial growth occurring as mixed-use development along major corridors.

Several proposed and connected project areas are adjacent to El Cerrito in Wildcat Canyon Regional Park. Future activities in the park would not cause growth in El Cerrito. Land uses in El Cerrito adjacent to the project areas include low-density residential, open space, and

recreation. There is some potential for infill development in the residential areas, but this is not expected to result in substantial growth.

4.13.3.3.7 UCB

The UCB 2020 Long Range Development Plan estimated that the on-campus population would increase by 11.6% between the 2001 and 2002 academic year and the year 2020 (UCB 2005). Student enrollment data indicate that the number of students enrolling in the fall increased approximately 11.5% between 2001 and 2010 (from 32,128 students enrolled in fall 2001 to 35,838 students enrolled in fall 2010). The plan also projected that by 2020, housing for an additional 2,600 people and 2,300 additional parking spaces would be needed. UCB estimated that it would require 18% more space to accommodate necessary additional classrooms, research facilities, administrative services, and other student resources. UCB plans to accommodate this additional space requirement in part by implementing more intense land use in existing areas of the campus.

The 2020 Long Range Development Plan addresses a section of the Hill Campus designated the Claremont Canyon Regional Preserve study area. This area includes the eastern end of the Frowning Ridge-PDM proposed project area and all of the Claremont-PDM proposed project area. The plan states that potential uses of this area include faculty housing and a campus retreat center. The 43-acre Claremont-PDM site is largely a eucalyptus forest. UCB proposes to eliminate all eucalyptus trees from the site. This would remove a physical barrier to development of the site but would also encourage expansion of native vegetation on the site. The site is probably less likely to be developed if dominated by native vegetation than if dominated by eucalyptus. The 2020 Long Range Development Plan states that more promising near-term options exist for both faculty housing and conference facilities and that these options must be fully explored before development of the Claremont Canyon Regional Preserve study area is given serious consideration (UCB 2005).

4.14 Transportation

This section describes existing transportation features and infrastructure in the proposed and connected project areas and planned transportation improvements in and adjacent to the project areas as a baseline for assessing the potential transportation impacts of the proposed and connected actions.

The study area for the transportation analysis consists of the jurisdictions where the proposed and connected actions would take place: the cities of Richmond, El Cerrito, Berkeley, and Oakland; unincorporated communities in Alameda and Contra Costa counties; and lands managed by EBRPD and UCB.

The transportation impact analysis in Section 5.13 addresses potential impacts of the proposed and connected actions and the no action alternative on the following:

- Traffic on nearby and adjacent freeways and local roads
- Traffic safety on project area roadways
- Transit operations
- Non-motorized vehicle circulation and conditions
- Consistency with local plans and policies

4.14.1 Regulatory Setting

The proposed and connected actions and the no action alternative would be limited to activities within and directly adjacent to existing parklands and open space areas; therefore, this section is focused on regulatory requirements of local and regional jurisdictions' plans as they relate to the proposed and connected project areas. A brief discussion of regional transportation agencies is included to provide the reader with an understanding of the regional context of transportation planning in the area.

4.14.1.1 Regional Transportation Agencies

Several transportation agencies fund or provide services to jurisdictions in the proposed and connected project areas. The California Department of Transportation (Caltrans) owns and operates California's freeway and state roads system, which include Interstate (I) 80, I-580, State Route (SR) 13, SR 24, and SR 123 (or San Pablo Avenue), all of which are near the project areas (Caltrans 2012a).

The Contra Costa Transportation Authority (CCTA) and the Alameda County Transportation Commission (ACTC) are the primary transportation planning agencies for the counties containing the proposed and connected project areas (ACTC 2012, CCTA 2012). The West Contra Costa Transportation Advisory Committee (WCCTAC) is one of four sub-regional transportation planning committees created in 1988 to advise the CCTA on transportation concerns specifically related to the cities of Richmond, El Cerrito, Hercules, Pinole, and San Pablo and transit agencies serving these cities (WCCTAC 2011).

Transit operations serving the project area are provided by the Alameda-Contra Costa Transit District (AC Transit), which provides local East Bay and regional transbay bus service, and by Bay Area Rapid Transit (BART), which offers regional heavy-rail train service throughout the Bay Area, including the East Bay. The "East Bay" is a common and informal term that refers to the lands on the eastern side of the San Francisco Bay, comprising large portions of western Alameda and Contra Costa counties.

4.14.1.2 Local Plans and Policies

As required by State of California law, cities and counties must adopt general plans that include goals and policies to guide current and long-term development in their communities. The transportation and/or circulation element of these general plans describes existing transportation facilities and outlines goals and policies for current and future transportation improvements. The following sections describe the transportation policies and goals for each jurisdiction in the proposed and connected project areas. In addition, EBRPD and UCB have specific development plans that provide transportation goals and guidelines for their management areas.

4.14.1.2.1 EBRPD

EBRPD has prepared a 2012 Master Plan Update (2012d) as a revision of its 1997 Master Plan (1996), in order to address the EBRPD's priorities and plans for future expansion of parks, trails, and services for the next decade. The draft 2012 plan is in the public review and comment phase. The Master Plan is intended to guide stewardship and development of current and future parks while maintaining a balance between natural resource conservation and recreational use. The Master Plan Map was updated in 2008 and shows several new areas EBRPD proposes to add to its jurisdiction.

The 1997 Master Plan divides the district into three separate planning areas. The proposed and connected project areas are in the West Metropolitan Sector, which extends from Crockett to San Leandro and is bordered on the west by San Francisco Bay and on the east by the East Bay Hills.

The Public Access and Services chapter of the EBRPD Master Plan includes information about access to the parks from residential areas or places of employment. EBRPD provides parking and trail heads at convenient locations to encourage access and use of the regional park system. Travel to the parks by foot, horseback, and bicycle is encouraged. In addition, EBRPD advocates and supports public transit service to the regional park system. EBRPD also provides more than 1,000 miles of trails, including regional trails that connect park areas to local communities.

4.14.1.2.2 Alameda County

A portion of the proposed and connected project areas is in Alameda County, mainly in the incorporated cities of Oakland and Berkeley. Oakland and Berkeley are covered by their own general plans, discussed in separate subsections below. The Alameda County General Plan includes goals and policies for the unincorporated community of Castro Valley, which is close to the project area farthest to the southeast, east of Lake Chabot.

The Alameda County General Plan consists of three plans with circulation elements that are specific to unincorporated communities and geographic areas; the southern portion of the project

area overlaps with the planning area for the Castro Valley General Plan. The Castro Valley General Plan was adopted in 1985 and is being updated (County of Alameda 1985). A draft plan was completed in January 2007 and was revised in July 2010 to incorporate new proposals and changes in programs since the 2007 draft (County of Alameda 2007 and 2010a).

The plan includes transportation goals, policies, and actions to protect residential neighborhoods from through-traffic, speeding, and non-residential parking, and limit heavy trucks from operating on designated residential streets (except for emergency, maintenance, and transit vehicles). The goals, policies, and actions also expand and enhance local bikeway connections; implement regional bicycle corridors identified in the Alameda County Bicycle Master Plan for Unincorporated Areas; provide safe, attractive, accessible walking routes; and implement the Alameda County Pedestrian Master Plan (County of Alameda 2006a and 2006b).

4.14.1.2.3 Contra Costa County

A portion of the proposed and connected project areas is in western Contra Costa County, north and northeast of the project areas in Alameda County. The Contra Costa County General Plan includes goals and policies for the unincorporated communities of Hasford Heights and Kensington, which are adjacent to project areas.

The Contra Costa County General Plan was adopted in January 2005 and outlines goals, policies, and implementation measures to guide development decisions through 2020. The Transportation and Circulation Element includes goals and policies that apply to the proposed and connected actions, such as measures to provide accessibility to all residents; minimize disturbances to slopes and natural features when constructing roads; expand, improve, and maintain facilities and safety for walking and bicycling; reduce conflicts among motorists, pedestrians, and bicyclists; preserve and enhance scenic routes in the county; coordinate scenic routes with access to public areas; and preserve “gateway” sections of scenic routes (County of Contra Costa 2005a).

4.14.1.2.4 City of Richmond

The City of Richmond General Plan (2011a) was recently adopted in April 2012. The Circulation Element of the plan includes several transportation goals and policies that apply to the proposed and connected actions, including measures to expand the system for different modes of transportation. The plan uses a context sensitive “place-based” approach to circulation planning; encourages multiple modes of transportation that continue to “ensure efficient mobility and access;” and plans, constructs, and maintains a safe, comprehensive, and integrated bicycle pedestrian system.

4.14.1.2.5 City of El Cerrito

The El Cerrito General Plan was last updated in August 1999 and emphasizes balancing residential, commercial, and civic uses in the city through the year 2020. The Transportation and Circulation Element includes policies that apply to the proposed and connected actions, including measures to provide a safe and convenient bicycle and pedestrian circulation system throughout the city, encourage transit system use, and maintain and improve critical transportation facilities for emergency vehicle access and evacuation (City of El Cerrito 1999).

4.14.1.2.6 City of Berkeley

The City of Berkeley General Plan was last updated in July 2001 and provides information about the community's long-range priorities and values. While the City is required to abide by the general plan's goals and policies, UCB and other state agencies within city limits are not legally obligated to comply with the plan. However, the plan encourages cooperation between agencies as a way to benefit all stakeholders involved in community decisions (City of Berkeley 2001a). In addition, UCB's planning policies are outlined in its 2020 Long Range Development Plan, discussed later in this section.

The Transportation Element of the General Plan includes several objectives and policies that apply to the proposed and connected actions, including measures to calm and slow traffic in residential areas; maintain, encourage, and improve public transportation use and access for all residents; reduce hazardous and/or heavy truck traffic; and provide emergency access and evacuation routes to all parts of the city (City of Berkeley 2001c).

4.14.1.2.7 City of Oakland

The City of Oakland (Oakland) General Plan was adopted in March 1998 and focuses on balancing citywide and individual neighborhood needs. The Land Use and Transportation Element includes policies and strategies to meet the travel needs of Oakland residents, 25% of whom do not have access to automobiles; ensure coordination with Oakland's major transportation providers; and provide opportunities for intermodal facilities and new transit operations. The General Plan identifies specific transportation concerns for the parts of the city adjacent to the proposed and connected project areas, including emergency vehicle access on narrow hillsides and additional vehicles at secondary housing units that further reduce mobility and safety (Oakland 1998).

4.14.1.2.8 UCB

The UCB 2020 Long Range Development Plan was developed in 2005 and includes an outline of planned land use and capital investments through the year 2020 (UCB 2003). The Strawberry Canyon-PDM, Claremont-PDM, and Frowning Ridge-PDM proposed actions are in the Hill Campus section of the UCB campus, an area of approximately 1,000 acres that extends from Stadium Rim Way to Grizzly Peak Boulevard. About 200 of the 1,000 acres are managed by the Lawrence Berkeley National Laboratory and not managed by the 2020 Long Range Development Plan. About 800 of the 1,000 acres are within the City of Oakland, the City of Berkeley, and unincorporated Contra Costa County. Plan goals relevant to the proposed and connected actions include encouraging recreational pedestrian access to the undeveloped parkland areas within the Hill Campus.

4.14.2 Methodology

NEPA does not require that transportation-specific significance thresholds be determined for the EIS. However, the Council of Environmental Quality regulations (40 CFR §§ 1500-1508) indicate that the context and intensity of the proposed and connected actions are the primary basis for assessment of transportation impacts. Further discussion of potential impacts,

mitigation measures, and best practices from plans and policies specific to these proposed and connected project areas is included in Section 5.13.

Transportation impacts of the proposed and connected actions were assessed in the following effect categories:

- Traffic flow
- Traffic safety
- Public transit
- Non-motorized transportation

Transportation, traffic, and circulation effects and impacts associated with the proposed and connected actions would be expected to occur primarily during the construction period because the maintenance phase of the actions would be substantially less intense in scale than the initial implementation phase. However, the maintenance phase for the proposed and connected actions is expected to last longer in duration but would have less equipment staging and direct roadway effects. These possible impacts include road closures, detours, and worker traffic. In Section 5.13, these impacts are analyzed for the proposed and connected actions and the no action alternative in each effect category listed above.

4.14.3 Existing Conditions

The majority of the proposed and connected project areas are on hillsides adjacent to residential neighborhoods in unincorporated portions of Alameda and Contra Costa counties and the cities of Richmond, El Cerrito, Berkeley, and Oakland. Several proposed project areas are in Miller/Knox Regional Shoreline in Richmond, near residential and industrial land uses. Several proposed project areas are owned by UCB.

The transportation study area includes the roadway, transit, and bicycle/pedestrian facilities within or adjacent to the project area, including roadways paralleling or crossing through the project areas. While many recreational trails and unpaved paths appear through the study area, only paved public roadways with general vehicular traffic were documented. Table 4.14-1 catalogs the list of these roadways for each project area, along with the roadway type and corresponding jurisdiction.

Table 4.14-1. Summary of Roadways in and Near Proposed and Connected Project Areas

Roadway	Action Type	Action Reference	Roadway Type	Jurisdiction
EBRPD – Sobrante Ridge Regional Preserve				
San Pablo Dam Drive	Proposed	SO001	Arterial	Richmond
Rain Cloud Drive	Proposed	SO001	Local	Richmond
Solitude Lane	Proposed	SO001	Local	Richmond
Silver Belt Drive	Proposed	SO001	Local	Richmond
Crows Nest Way	Proposed	SO001	Local	Richmond
EBRPD – Wildcat Canyon Regional Park				
Bonita Road	Proposed	WC004	Local	Richmond
Park Avenue	Connected	WC005	Local	Richmond
Wildcat Canyon Parkway	Connected	WC005	Collector	Richmond
Leneve Place	Proposed	WC011	Local	El Cerrito
Kensington Road	Proposed	WC011	Local	El Cerrito
Kensington Court	Proposed	WC011	Local	Kensington*
Lake Drive	Proposed/ Connected	WC011/WC011	Local	Kensington*
Marin Avenue	Connected	WC005	Local	Richmond
Arlington Boulevard	Connected	WC005	Local	Richmond
Harbor View Avenue	Proposed	WC004	Local	Richmond
McBryde Avenue	Connected	WC005	Collector	Richmond
Jerilynn Avenue	Proposed	WC004	Local	Richmond
Vista Heights Road	Proposed	WC009	Local	El Cerrito
Rifle Range Road	Proposed	WC009	Local	El Cerrito
Wildcat Drive	Proposed	WC010	Local	El Cerrito
Terrace Drive	Proposed	WC011	Local	El Cerrito
Purdue Avenue	Proposed	WC011	Local	Kensington(1)
Los Altos Drive	Proposed	WC011	Local	Kensington(1)
Kenyon Drive	Proposed	WC011	Local	Kensington(1)
EBRPD – Miller/Knox Regional Shoreline				
Dornan Drive	Proposed	All MK Project areas	Local	Richmond
West Cutting Boulevard	Proposed	N/A	Arterial	Richmond
Garrard Boulevard	Proposed	MK001	Local	Richmond
Marine View Avenue	Proposed	MK001	Local	Richmond
Crest Avenue	Proposed	MK001	Local	Richmond
Scenic Avenue	Proposed	MK002	Local	Richmond
EBRPD – Tilden Regional Park				
Canon Drive	Proposed/ Connected	TI006/TI006	Local	Kensington(1)
Wildcat Canyon Road	Connected	TI009, TI010, TI011, TI020, TI021	Local	Berkeley
Central Park Drive	Connected	TI006, TI008a, TI010	Local	Berkeley
Golf Course Road	Proposed/ Connected	TI012/TI012	Local	Berkeley
Grizzly Park Boulevard	Proposed/ Connected	TI012, TI013, TI014, TI015/TI012, TI015	Collector	Berkeley
Brook Road	Connected	TI008a	Local	Berkeley
Lake Anza Road	Connected	TI008a, TI010	Local	Berkeley
Anza View Road	Connected	TI020, TI021	Local	Berkeley
Shasta Road	Proposed/ Connected	TI012/TI011, TI012	Local	Berkeley
Park Hills Road	Proposed/ Connected	TI012/TI011	Local	Berkeley
Summit Road	Proposed	TI012	Local	Berkeley

Table 4.14-1. Summary of Roadways in and Near Proposed and Connected Project Areas

Roadway	Action Type	Action Reference	Roadway Type	Jurisdiction
South Park Drive	Proposed/ Connected	TI015/TI019, TI021	Local	Berkeley
EBRPD – Claremont Canyon Regional Preserve				
Stonewall Road	Proposed/ Connected	CC001/ C001	Local	Oakland
Claremont Avenue	Proposed/ Connected	CC005, CC010/CC004, CC009	Arterial	Oakland
Panoramic Way	Connected	CC002	Local	Oakland
Gelston Street	Proposed/ Connected	CC010/CC008	Local	Oakland
Drury Road	Connected	CC009	Local	Oakland
Grizzly Peak Boulevard	Connected	CC009	Collector	Oakland
Marlborough Terrace	Connected	CC009	Local	Oakland
Norfolk Road	Connected	CC009	Local	Oakland
EBRPD – Sibley Volcanic Regional Preserve				
Grizzly Peak Boulevard	Proposed/ Connected	SR003, SR004/SR003, SR005	Collector	Oakland
Skyline Boulevard	Proposed/ Connected	SR003, SR005/SR002b, SR003, SR005	Local	Oakland
Thorndale Drive	Connected	SR002b	Local	Oakland
Elverton Drive	Connected	SR002b	Local	Oakland
EBRPD – Huckleberry Botanic Regional Preserve				
Skyline Boulevard	Proposed	HP001, HP002	Local	Oakland
Villanova Drive	Proposed	HP002	Local	Oakland
Manzanita Drive	Proposed	HP002	Local	Oakland
EBRPD – Redwood Regional Park				
Skyline Boulevard	Proposed/ Connected	RD004/RD008	Local	Oakland
Redwood Road	Proposed/ Connected	RD009/RD009	Local	Oakland
Pine Hills Drive	Connected	RD001	Local	Oakland
Shirley Drive	Proposed	RD004	Local	Oakland
Wilton Drive	Proposed	RD004	Local	Oakland
EBRPD – Anthony Chabot Regional Park				
Redwood Road	Proposed/ Connected	AC001, AC002/AC001	Local	Oakland
Skyline Boulevard	Proposed/ Connected	AC006, AC007/AC007	Local	Oakland
Marciel Road	Proposed/ Connected	AC013, AC014/AC010, AC013	Local	Oakland
Clairpointe Way	Proposed/ Connected	AC006/AC006	Local	Oakland
Gun Range Road	Proposed/ Connected	AC014/AC010	Local	EBRPD
EBRPD – Leona Canyon Regional Open Space Preserve				
Campus Drive	N/A	N/A	Local	Oakland
Skyline Boulevard	Proposed	LE005	Local	Oakland
Graham Place	Proposed	LE005	Local	Oakland
Lexford Place	Proposed	LE005	Local	Oakland
EBRPD – Lake Chabot Regional Park				
Hillsborough Drive	Proposed	LC010	Local	Castro Valley(1)
Lake Chabot Road	N/A	N/A	Local	Castro Valley(1)
Seven Hills Road	N/A	N/A	Local	Castro Valley(1)

Table 4.14-1. Summary of Roadways in and Near Proposed and Connected Project Areas

Roadway	Action Type	Action Reference	Roadway Type	Jurisdiction
Redwood Road	N/A	N/A	Local	Castro Valley[1]
UCB – Strawberry Canyon-PDM				
Grizzly Peak Boulevard	Proposed	Strawberry Canyon-PDM	Collector	Berkeley
Centennial Drive	Proposed	Strawberry Canyon-PDM	Local	Berkeley
Gauss Way	Proposed	Strawberry Canyon-PDM	Local	Berkeley
UCB – Claremont-PDM				
Claremont Avenue	Proposed	Claremont-PDM	Local	Oakland
UCB – Frowning Ridge-PDM[2]				
Grizzly Peak Boulevard	Proposed	Frowning Ridge-PDM	Collector	Oakland
Oakland – North Hills-Skyline-PDM				
Grizzly Peak Boulevard	Proposed	North Hills-Skyline-PDM	Collector	Oakland
Westmoorland Drive	Proposed	North Hills-Skyline-PDM	Local	Oakland
Buckingham Boulevard	Proposed	North Hills-Skyline-PDM	Local	Oakland
Tunnel Road	Proposed	North Hills-Skyline-PDM	Local	Oakland
Bay Forest Drive	Proposed	North Hills-Skyline-PDM	Local	Oakland
Oakland – Caldecott Tunnel-PDM				
Broadway	Proposed	Caldecott Tunnel-PDM	Arterial	Oakland

[1] Kensington and Castro Valley are unincorporated communities and are governed by Contra Costa and Alameda County policies.
[2] Frowning Ridge-PDM is a project area located in the City of Oakland but would be implemented and maintained by UCB.

"N/A" refers to roadway facilities that are not directly adjacent to proposed or connected project areas. However, they were considered to comprise key access roads or locations where project areas would be reached.

4.14.3.1 Existing Facilities

The local transportation network serving the proposed and connected project areas includes roadways, transit routes, and pedestrian and bicycle facilities. Roadways are generally classified in the following categories in city and county general plans:

- **Freeways**: Interstate highways and federal/state routes that are high-speed, high-capacity roadway facilities with limited grade-separated interchanges, generally serving long-distance and interregional trips between cities.
- **Arterials**: Moderate-to-high-speed and high-capacity facilities that facilitate intraregional trips through the local community.
- **Collectors**: Moderate-speed, moderate-capacity roadways that connect arterials with local streets and facilitate circulation in neighborhoods.
- **Local Streets**: Low-speed, low-capacity facilities that provide direct access to local neighborhood properties. These roads typically do not allow for or encourage through travel and are primarily residential in nature.

For public transit, local transit routes are identified via local bus stops as well as the distance of the project areas to regional train stations.

Bicycle facilities are generally identified as Class I, Class II, or Class III and defined as follows:

- **Class I**: Bicycle paths or trails with a completely separate right-of-way for the exclusive use of bicycles and pedestrians with vehicle cross-flow minimized.

- **Class II**: Bicycle lanes with a restricted right-of-way with a striped lane on a street or highway.
- **Class III**: Bicycle routes where there is no separate lane and bicycles share the road with other vehicles. In some instances shared bicycle-vehicle lane markings called "sharrows" are marked on the pavement.

The existing transportation facilities for each project area are described in more detail below. For the location of major roadway facilities, please refer to Figure 1-1 in Section 1.

4.14.3.1.1 Regional Facilities

The following transportation facilities offer access to several or all of the proposed and connected project areas from a regional standpoint and are listed in the following subsections.

Freeways and Major Regional Arterials

Two interstate freeways and three state highways serve the project area. These interstate freeways and state highways include I-80, I-580, SR 13, and SR 24.

- **I-80** is near the northern project areas of the proposed action. It provides regional access to the study area from Sacramento, Davis, Vallejo, and other parts of the Central Valley to the northeast and from San Francisco and Oakland to the south and west. It ends at the junction with the Central Freeway (U.S. Highway 101) to the west in San Francisco and continues past Sacramento to the Nevada border to the east. Within the project vicinity, it generally operates in a north-south direction. I-80 generally has four to five lanes in each direction. Both westbound and eastbound directions have a high occupancy vehicle lane for vehicles with two or more occupants, which operates in the leftmost lane from just east of the Bay Bridge to the Carquinez Bridge in Vallejo. It operates during the morning peak commute between 5 a.m. and 9 a.m. and during the evening peak commute between 3 p.m. and 7 p.m. I-80 merges with I-580 in the City of Albany and departs from I-580 at the MacArthur Maze. Average daily traffic (ADT) in the year 2011 was measured at 186,000 vehicles per day at I-80 and McBryde Avenue, emphasizing I-80's role as a major freeway in the San Francisco Bay Area.
- **I-580** generally runs in a northwest-southeast direction until Castro Valley when it begins running in an east-west direction. It provides regional access to the study area from parts of Marin County to the northwest and from Oakland and eastern parts of Alameda County to the south and east. I-580 begins near the project areas near Richmond after crossing the Richmond-San Rafael Bridge toward San Rafael to the north and Dublin and beyond to the south and east. Within the project vicinity, it generally operates in a northwest-southeast direction. I-580 generally has three to five lanes in each direction. I-580 merges with I-80 in the City of Albany and departs from I-80 at the MacArthur Maze. Both westbound and eastbound directions have a high occupancy vehicle lane for vehicles with two or more occupants, which operates in the leftmost lane for the duration of the merge with I-80. It operates during the morning peak commute between 5 a.m. and 9 a.m. and during the evening peak commute between 3 p.m. and 7 p.m. Year 2011 ADT was measured at 148,000 vehicles per day at I-580 and Lake Chabot Road.

- **SR 13** begins as Ashby Avenue in Berkeley at I-80/I-580 near the Aquatic Park. Ashby Avenue is a two to four-lane arterial roadway with peak period (morning westbound and evening eastbound) tow-away parking zones. It generally runs in an east-west direction. Near SR 24 in Upper Rockridge and Lake Temescal, SR 13 transitions into the Warren Freeway and generally runs in a northwest-southeast direction, paralleling the East Bay Hills. For the freeway section of SR 13, the roadway generally has two lanes in each direction. SR 13 eventually merges with I-580 near Mills College and Leona Heights. For the freeway portion of SR 24, year 2011 ADT along SR 13 at the Redwood Road interchange was measured at 45,000 vehicles per day. At the Claremont Avenue/Ashby Avenue intersection in Berkeley, ADT was measured to be 24,400 vehicles per day along Ashby Avenue.
- **SR 24** is a short freeway that begins in Oakland at the I-580/I-980 interchange and runs in a northeast-southwest direction. Additionally, it has an interchange with SR 13 in the Oakland Hills. SR 24 then runs below Sibley Volcanic Regional Preserve through the Caldecott Tunnel to the City of Orinda. The roadway generally operates with four lanes in each direction. SR 24 eventually merges with I-680 in Walnut Creek. For the freeway portion of SR 24, year 2011 ADT was measured at 148,000 vehicles per day at the Caldecott Tunnel entrance.

Transit Network

The proposed and connected project areas are largely within uninhabited park portions of the East Bay Hills, particularly along hillsides directly adjacent to residential neighborhoods. As a result, there is limited access to regional public transit and minimal local transit stop availability. Multiple transit options are available within the denser urbanized portions of the East Bay, including local transit service via AC Transit and regional rail transit via BART and Amtrak. However, only AC Transit currently provides transit service within and around the proposed and connected project areas.

Bay Area Rapid Transit

BART operates regional rail transit service connecting the East Bay (from Pittsburg/Bay Point, Richmond, Dublin/Pleasanton and Fremont) with San Mateo County and San Francisco. In the East Bay, BART operates in the cities of Richmond, El Cerrito, Albany, Berkeley, Oakland, and points south. None of BART's service routes directly serve any of the project areas (BART 2012).

Alameda-Contra Costa Transit

AC Transit is the primary bus system, serving two dozen cities and unincorporated areas in the East Bay with approximately 110 bus lines. There are four types of AC Transit lines:

- Local lines
- Transbay lines, which connect East Bay destinations with San Francisco
- All nighter lines, which provide late-night limited transit service
- Supplementary lines, which primarily provide transit service for schools and special events (AC Transit 2012a and 2012b)

Further discussion of AC Transit bus routes serving specific project areas are shown in the following section.

Amtrak

Amtrak operates several train routes, which have stops near the proposed and connected project areas. These include the Capitol Corridor, San Joaquin, California Zephyr, and Coast Starlight routes. However, there are no Amtrak stations immediate adjacent to the proposed and connected project areas.

4.14.3.1.2 EBRPD Projects

As noted previously, all regional transportation facilities, including the five state highways and freeways, BART, AC Transit, and Amtrak, serve the EBRPD project areas; however, none of the facilities are immediately adjacent to or within the proposed and connected project areas.

For the location of each referenced proposed and connected project area below, please refer to Figures 3-1a through 3-1j in Section 3 for the project map.

Sobrante Ridge Regional Preserve Project Areas
(Proposed: SO001)

The main entrance to the Sobrante Ridge Regional Preserve is at the end of Coach Drive in the City of Richmond. Other entrances are at the end of Heavenly Ridge Lane and along Conestoga Way. The park is accessible from the San Pablo Dam Road interchange on I-80 in Richmond, approximately 4 miles to the west, and the Appian Way interchange on I-80 in Pinole, approximately 2.7 miles to the northwest.

Roadways

The closest local roads to proposed project area SO001 are Rain Cloud Drive, Solitude Lane, Silver Belt Drive, and Crows Nest Way. Proposed project area SO001 is most closely near Rain Cloud Drive. However, there are no entrances from this roadway. The nearest regional roadway is San Pablo Dam Drive, which connects to I-80 in El Sobrante. The closest parking facilities to the project area are at the Heavenly Ridge Trail trailhead, approximately 0.2 miles from the northern boundary of the project area.

Bicycle and Pedestrian Facilities

Bicycling is allowed on approved trails and naturalist programs. The closest bicycle trail to the project area is the Heavenly Ridge Trail in Sobrante Ridge Regional Preserve, whose trailhead is approximately 0.2 miles from the northern boundary of the project area. This trail turns into Manzanita Trail and eventually leads to Sobrante Ridge Trail, which is part of the Bay Area Ridge Trail. These trails are for hikers, horses, and bicycles. A portion of the Manzanita Loop for hikers and horses is within the project area.

Transit Facilities

No AC Transit or other transit lines serve this project area (AC Transit 2012a and 2012b).

Wildcat Canyon Regional Park Project Areas
(Proposed: WC003, WC004, WC009, WC010, and WC011; Connected: WC005, WC006, and WC011)

The main entrance to the Wildcat Canyon Regional Park is at 5755 McBryde Avenue in the City of Richmond. The park is accessible from the I-80 interchange with Solano Avenue in El Cerrito, approximately 0.75 miles to the southwest, or the I-80 interchange with McBryde Avenue, about 0.5 miles to the west in Richmond. The park can also be accessed through the Tilden Nature Area via Canon Drive from the intersection of Grizzly Peak Boulevard and Spruce Street.

Roadways

Bonita Road is a local road in Richmond that ends at Bonita Gates Trail, which serves as an access point to proposed project area WC004.

Park Avenue is a local road in Richmond and runs along the southern border of connected project area WC005. At the Marin Avenue intersection Park Avenue connects to McBryde Avenue, which serves as an access point to I-80. Park Avenue eventually terminates at the Wildcat Canyon Regional Park.

Wildcat Canyon Parkway is a collector road in Richmond that serves as an access point to connected project area WC005. It intersects with Park Avenue and continues into Wildcat Canyon Regional Park. It eventually turns into Wildcat Creek Trail at the Mezue Trail intersection within the park. Wildcat Creek Trail ends at the Environmental Education Center.

Leneve Place is a local road in El Cerrito that runs adjacent to proposed project area WC011. The roadway is lined on both sides with residential structures, and the only direct access to the proposed project area is at the end of Leneve Place where it intersects with Ivy Court, another local residential road. Terrace Drive also connects Leneve Place to Kensington Road.

Kensington Road is another local road in El Cerrito that runs adjacent to proposed project area WC011 and is connected to Leneve Place by Terrace Drive. As with Leneve Place, Kensington Road is lined with residential structures. The only access point to proposed project area WC011 is at the road terminus, after the Cowper Avenue and Kensington Court intersection.

Kensington Court is another local road in Kensington. This roadway eventually turns into a trail into Wildcat Canyon Regional Park approximately 0.1 miles southeast of the Cowper Avenue and Kensington Road intersection. This trail serves as an access point to proposed project area WC011 and eventually connects to the Fire Trail within the park near Neighborhood School.

Lake Drive is a local road in Kensington that serves as a direct access point to proposed project area WC011 and connected project area WC011. This roadway also turns into a trail that eventually connects to the Fire Trail within Wildcat Canyon Regional Park. The Fire Trail begins near the Neighborhood School and ends at the Kenyon Avenue and Grizzly Peak Boulevard intersection in Berkeley.

The following list shows other local roads not directly accessible to the project areas and their corresponding proposed and connected project areas they are closest to:

- Marin Avenue (connected WC005)
- Arlington Boulevard (connected WC005)
- Harbor View Avenue (proposed WC004)
- McBryde Avenue (connected WC005)
- Jerilynn Avenue (proposed WC004)
- Vista Heights Road (proposed WC009)
- Rifle Range Road (proposed WC009)
- Wildcat Drive (proposed WC010)
- Terrace Drive (proposed WC011)
- Purdue Avenue (proposed WC011)
- Los Altos Drive (proposed WC011)
- Kenyon Avenue (proposed WC011)

The nearest parking area to any of the project areas is off of Park Avenue at the Wildcat Canyon Staging Area approximately 0.2 miles east of the intersection with McBryde Avenue. Proposed project areas WC003 and WC004 and connected project area WC005 are the closest project areas.

Bicycle and Pedestrian Facilities

Most trails in the park are unpaved and considered multi-use trails for hikers, equestrians, and bicyclists. Wildcat Creek Trail runs adjacent to portions of proposed and connected actions along the southwestern boundary of the park. This trail runs in a northwest-southeast direction across the entire length of Wildcat Canyon Regional Park.

Transit Facilities

The following AC Transit lines and stops are near and serve the project area. They are listed by their location in relation to the proposed and connected project areas from north to south.

- Line 684 – This is a supplementary line with one morning trip, running from Richmond BART to El Cerrito High School and Portola Middle School. The stops closest to the project areas are along McBryde Avenue, less than 0.2 miles away from the Alvarado Park portion of the project area.
- Line 7 – This is a local line running from the El Cerrito del Norte BART station to the Downtown Berkeley BART station, providing service in Berkeley, Albany, and El Cerrito. It operates at approximately 30-minute intervals. The stops closest to the project areas are along Arlington Boulevard, about 0.3 miles away from the portion of the project area located in the community of Kensington.
- Line H – This is a Transbay line running to the San Francisco Temporary Transbay Terminal during the morning peak period and to Berkeley and Richmond during the evening peak period. The stops closest to the project areas are along Arlington

Boulevard, about 0.3 miles away from the portion of the project area located in the community of Kensington.

- Line 67 – This is a local line running from the downtown Berkeley BART station to Grizzly Peak Boulevard and Spruce Street, providing transit service to the Berkeley portion of the East Bay Hills. It operates at approximately 40-minute intervals. During the weekends, it also serves Tilden Regional Park. The stops closest to the project areas are at Kenyon Avenue and Beloit Avenue, approximately 0.4 miles away from the project area.
- Line 65 – This is a local line running from the downtown Berkeley BART station to Lawrence Hill of Science or Senior Avenue and Grizzly Peak Boulevard. It also provides transit service to the Berkeley portion of the East Bay Hills and operates at approximately 30-minute intervals. The stop closest to the project areas is at Grizzly Peak Boulevard and Shasta Road, approximately 0.4 miles from the project area (AC Transit 2012a and 2012b).

Miller/Knox Regional Shoreline Project Areas (Proposed: MS001, MK002, MK003, MK004, and MK005)

The Miller/Knox Regional Shoreline is at 900 Dornan Drive in the City of Richmond. The park can be reached from the I-580 interchange with Canal Boulevard in Richmond, approximately 0.75 miles northeast of the project areas.

Roadways

Dornan Drive is a local road in Richmond that bisects Miller/Knox Regional Shoreline. It serves as the main access point to the park and all proposed project areas.

West Cutting Boulevard in Richmond is north of the proposed project areas and is designated a transit priority street north of the Miller/Knox Regional Shoreline.

The following are local roads and the proposed project areas they are closest to.

- Garrard Boulevard (proposed MK001)
- Marine View Avenue (proposed MK001)
- Crest Avenue (proposed MK001)
- Scenic Avenue (proposed MK002)

In addition, multiple parking lots are along the west side of Dornan Drive near the main park facilities.

Bicycle and Pedestrian Facilities

The nearest bicycle facilities to the project area are on the west side of Dornan Drive. None of these bicycle paths is within the boundaries of the project areas. Multiple “Hiker Only” trails are within the project areas, including Marine View Trail, Crest Trail, Old Country Road, and West Ridge Trail.

Transit Facilities

The following AC Transit lines and stops are near and serve the project area. They are listed by their location in relation to the proposed project areas from north to south.

- Line 607 – This is a supplementary line, with one morning trip, running from Point Richmond to Richmond High School. The closest stop to the project area is at the intersection of South Garrard Boulevard and West Richmond Avenue, about 0.4 miles away from the project area.
- Line 72M – This is a local line running from Point Richmond to the Oakland Amtrak station at Jack London Square. It runs at approximately 30-minute intervals. The closest stop to the project area is at South Garrard Boulevard and Richmond Avenue, about 0.4 miles away from the project area (AC Transit 2012a and 2012b).

Tilden Regional Park Project Areas
(Proposed: TI006, TI012, TI013, TI014, TI015, TI016, and TI022; Connected: TI006, TI008a, TI008b, TI009, TI010, TI011, TI012, TI014, TI015, TI018, TI019, TI020, and TI021)

Tilden Regional Park is in the Berkeley Hills just north of SR 24. The park can be accessed from multiple entrances, including the Fish Ranch Road exit east of the Caldecott Tunnel along Grizzly Peak Boulevard, where entrance to the steam trains, golf course, Botanic Garden, and hiking trails can be accessed. The park can also be approached via the west side in Berkeley from Canon Drive where Wildcat Canyon Road and Grizzly Peak Boulevard intersect, Shasta Road near the Tilden Golf Course, and other local road access points. From the east side of the East Bay Hills, the park can be accessed from Wildcat Canyon Road off San Pablo Dam Road just north of Orinda Village, approximately 2.5 miles from the main recreational parts of Tilden Regional Park.

Roadways

Canon Drive is a local road in Kensington that serves as a direct access point to proposed project area TI006 and connected project area TI006. This roadway eventually merges with Central Park Drive, which leads to the Environmental Education Center in Tilden Regional Park.

Wildcat Canyon Road is a local road in Berkeley that runs directly adjacent to and through multiple connected project areas, including TI009, TI010, TI011, TI020, and TI021. This roadway intersects with San Pablo Dam Road to the east, which eventually connects to I-80 to the north and SR 24 to the south.

Central Park Drive is a local road in Berkeley that also runs near and through multiple connected project areas. It begins in the north at the Environmental Education Center in Tilden Regional Park and continues south until it intersects with Wildcat Canyon Road at the Park Hills Road intersection. It runs adjacent to connected action TI006 and through connected actions TI008a and TI010.

Golf Course Road is another local road in Berkeley that runs adjacent and through multiple proposed and connected project areas, including proposed project area TI012 and connected project area TI012. This roadway begins at the Shasta Road, Park Hills Road, and Bay Tree Lane

intersection and runs south until it intersects and ends at Grizzly Peak Boulevard and Centennial Drive. For portions of this roadway, Selby Trail in Tilden Regional Park comes close and eventually ends at Golf Course Road near the Grizzly Peak Boulevard and Centennial Drive intersection.

Grizzly Peak Boulevard is a local and collector road in Berkeley and runs north to the southern boundary of Wildcat Canyon Regional Park and south adjacent to Tilden Regional Park. It continues south past other EBRPD parks. Proposed project areas TI012, TI013, TI014, and TI015 and connected project areas TI012 and TI015 can be directly accessed from Grizzly Peak Boulevard.

The following are local roads and the proposed and connected project areas they are closest to.

- Brook Road (connected TI008a)
- Lake Anza Road (connected TI008a and TI010)
- Anza View Road (connected TI020 and TI021)
- Shasta Road (proposed TI012; connected TI011 and TI012)
- Park Hills Road (proposed TI012; connected TI011)
- Summit Road (proposed TI012)
- South Park Drive (proposed TI015; connected TI019 and TI021)

Parking is available within many sections of the park. Off-street parking lots are available at several park features, including the botanic garden, steam train, merry-go-round, and other areas. There is little to no on-street parking available along roads within Tilden Regional Park.

Bicycle and Pedestrian Facilities

Many multi-use pedestrian hiking and bicycle trails are near or traverse proposed and connected project areas. These include Memory Trail (for hikers and horses only), Selby Trail, Wildcat Gorge Trail, Golf Course Trail, Redwood Trail, Grizzly Peak Trail, and Vollmer Peak Trail.

As the proposed and connected project areas are along the East Bay Hill slopes and are substantially hilly, many of the local roads connecting to and within Tilden Regional Park see limited pedestrian and bicycle usage. However, some recreational bicycle usage within the park can be expected on weekends.

Transit Facilities

The following AC Transit lines and stops are near and serve the project area. They are listed by their location in relation to the proposed and connected project areas from north to south.

- Line 67 – This is a local line running from the Downtown Berkeley BART station to Grizzly Peak Boulevard and Spruce Street, providing transit service to the Berkeley portion of the East Bay Hills. It operates at approximately 40-minute intervals. During the weekends, it also serves Tilden Regional Park. The stops closest to the project areas

are along Wildcat Canyon Road, directly fronting the park and along the affected action sites.

- Line 65 – This is a local line running from the Downtown Berkeley BART station to Lawrence Hill of Science or Senior Avenue and Grizzly Peak Boulevard. It also provides transit service to the Berkeley portion of the East Bay Hills and operates at approximately 30-minute intervals. The stops closest to the project areas are along Grizzly Peak Boulevard, approximately 0.25 miles away from the project area (AC Transit 2012a and 2012b).

Claremont Canyon Regional Preserve Project Areas
(Proposed: CC001, CC003, CC006, CC007, CC008, CC010, and CC012; Connected: CC001, CC002, CC003, CC004, CC005, CC008, CC009, CC010, and CC011)

The main entrance to Claremont Canyon Regional Preserve is on Stonewall Road off of Claremont Avenue, which is a block north of the Claremont Hotel. The preserve can be reached from the SR 24 interchange with Fish Ranch Road, immediately east of the Caldecott Tunnel (approximately 2.3 miles to the northeast), or by surface streets such as Tunnel Road, Ashby Avenue, and Claremont Avenue from the west side of the East Bay Hills.

Roadways

Stonewall Road is a short local road in Oakland that serves as the main entrance to the Claremont Canyon Regional Preserve. It also provides access to proposed project area CC001 and connected project area CC001. This roadway eventually ends at and connects to Claremont Avenue.

Claremont Avenue is an arterial road in Oakland. It begins at the intersection with Telegraph Avenue in the south and continues generally in a northeast direction until it ends at the intersection with Grizzly Peak Boulevard. Claremont Avenue then turns into Fish Ranch Road and eventually terminates at SR 13 near the east entrance of the Caldecott Tunnel. The roadway provides direct access to multiple proposed and connected project areas, including proposed project areas CC005 and CC010, and connected project areas CC004 and CC009.

The following are local roads and the proposed and connected project areas they are closest to.

- Panoramic Way (connected CC002)
- Gelston Street (proposed CC010; connected CC008)
- Drury Road (connected CC009)
- Grizzly Peak Boulevard (connected CC009)
- Marlborough Terrance (connected CC009)
- Norfolk Road (connected CC009)

No off-street parking is provided at Claremont Canyon Regional Preserve, and very limited amounts of on-street parking are available along Stonewall Road.

Bicycle and Pedestrian Facilities

Bicycles are not allowed in Claremont Canyon Regional Preserve; therefore, it is used primarily for hikers and equestrians.

According to the City of Oakland Bicycle Master Plan (2007a and 2007b), the proposed Class II bicycle lane along Claremont Avenue east of Stonewall Road is the closest element of the Oakland bicycle network. This section of Claremont Avenue includes an incline and hill of nearly 800 feet in elevation change over a 1.6 mile length.

Transit Facilities

There is one AC Transit line and stop near the project area. Line 49 is a local line two-way loop running clockwise ("A" loop) and counterclockwise ("B" loop). It includes access to the Rockridge BART, Ashby BART, and Downtown Berkeley BART stations, and runs primarily along College Avenue and Ashby Avenue. The closest stop to the project area is at Claremont Avenue and Ashby Avenue, approximately 0.3 miles away from the preserve (AC Transit 2012a and 2012b).

Sibley Volcanic Regional Preserve
(Proposed SR001, SR003, SR004, and SR005; Connected SR002a, SR002b, SR003, SR005, SR006, and SR007)

Sibley Volcanic Regional Preserve is at 6800 Skyline Boulevard in Oakland and can be reached from the SR 24 interchange with Fish Ranch Road (approximately 1.1 miles northwest of the preserve entrance), which intersects with Grizzly Peak Boulevard northwest of the interchange. Grizzly Peak Boulevard intersects with Skyline Boulevard immediately to the west of the preserve entrance (EBRPD 2012d).

Roadways

Grizzly Peak Boulevard is a collector road in Oakland. While it does intersect with SR 24 in Oakland, there is no direct freeway entrance at this location. Grizzly Peak Boulevard continues north into Berkeley and runs adjacent to and through many other EBRPD parks north of Sibley Volcanic Regional Preserve. Proposed project areas SR003 and SR004 and connected project areas SR003 and SR005 are near the roadway. Grizzly Peak Boulevard terminates at the Skyline Boulevard and Diablo Drive intersection next to the entrance of the regional preserve.

Skyline Boulevard is a local road in Oakland and runs adjacent to multiple proposed and connected project areas. These include proposed project areas SR003 and SR005 and connected project areas SR002b, SR003, and SR005. Skyline Boulevard begins east of SR 24 and continues in an east-southeast direction through various EBRPD parks until it terminates at Grass Valley road near Anthony Chabot Regional Park.

The following are local roads and the proposed and connected project areas they are closest to.

- Thorndale Drive (connected SR002b)
- Elverton Drive (connected SR002b)

The only parking facility in the park is at the Sibley Staging Area near the park entrance off Skyline Boulevard and Water Tank Road. This is also within the boundaries of proposed project area SR005.

Bicycle and Pedestrian Facilities

There are a few multi-use trails, including the Skyline Trail from the Sibley Staging Area to where it turns into the Bay Area Ridge Trail near Old Tunnel Road, which is within the boundaries of a proposed project area. Other multi-use trails are in the northern part of the preserve outside of any proposed or connected project areas. The rest of the trails within Sibley Volcanic Regional Preserve are reserved for pedestrians and equestrians, including the Round Top Loop Trail trailhead, which is also within the boundaries of a proposed project area.

According to the City of Oakland Bicycle Master Plan (2007b), the Class III bicycle routes along Skyline Boulevard and Grizzly Peak Boulevard are the closest elements of the Oakland bicycle network. The route along Grizzly Peak Boulevard is relatively flat but with some between 3 and 6% street grade changes near the Caldecott Tunnel. The portion of Skyline Boulevard in this area includes grade changes ranging between 3 and 9%.

Transit Facilities

AC Transit line 642 is near and serves the project areas. This is a supplementary line with one morning and one evening trip in the eastbound direction and three evening trips in the westbound direction. It runs during the weekdays between Skyline Boulevard and Tunnel Road in Oakland to Montera Middle School. The closest stops to the project areas are along Tunnel Road and Broadway Terrace, about 0.5 miles from the project area (AC Transit 2012a and 2012b).

Huckleberry Botanic Regional Preserve Project Areas (Proposed HP001, HP002, HP003, and HP004; Connected HP004)

Huckleberry Botanic Regional Preserve is on Skyline Boulevard between Broadway Terrance and Snake Road in Oakland. The park can be accessed from the SR 24 interchange with Fish Ranch Road east of Caldecott Tunnel approximately 1.3 miles from the western edge of the preserve. Fish Ranch Road intersects with Grizzly Peak Boulevard northwest of the SR 24 interchange, and Grizzly Peak Boulevard eventually intersects with Skyline Boulevard, approximately 0.5 miles from the western edge of the preserve. The main entrance is on Skyline Boulevard, past Sibley Volcanic Regional Preserve.

Roadways

The following are local roads and the proposed and connected project areas they are closest to.

- Skyline Boulevard (proposed HP001, HP002)
- Villanova Drive (proposed HP002)
- Manzanita Drive (proposed HP002)

The only parking facility in the preserve is at the Huckleberry Staging Area at the Huckleberry Path trailhead off Skyline Boulevard. This is also within the boundaries of proposed project area HP002.

Bicycle and Pedestrian Facilities

Bicycles are prohibited within the Huckleberry Botanic Regional Preserve; therefore, bicycle traffic, aside from some recreational bicycle trips, is limited in the area. According to the City of Oakland Bicycle Master Plan (2007a and 2007b), the Class III bicycle route along Skyline Boulevard is the closest element of the Oakland bicycle network. The street grade for this stretch of Skyline Boulevard typically ranges anywhere between 3 and 9%.

Similar to bicycle facilities, as the regional preserve is among the East Bay Hills and serves low amounts of pedestrian demand, very little dedicated pedestrian facilities are available along project roadways. One recreational hiking trail is provided within the regional preserve.

Transit Facilities

AC Transit line 642 is near and serves the project areas. This is a supplementary line with one morning and one evening trip in the eastbound direction and three evening trips in the westbound direction. It runs during the weekdays between Skyline Boulevard and Tunnel Road in Oakland to Montera Middle School. The closest stops to the project areas are along Colton Boulevard and Arrowhead Drive, approximately 0.25 miles away from the project area (AC Transit 2012a and 2012b).

Redwood Regional Park Project areas
(Proposed RD001, RD002, RD003, RD004, RD005a, RD005b, RD009, and RD011; Connected RD001, RD003, RD004, RD008, and RD009)

Redwood Regional Park is at 7868 Redwood Road in Oakland about 2 miles east of Skyline Boulevard. The main entrance to the park is available via Redwood Gate off of Redwood Road. The park can be accessed from the SR 13 interchange with Redwood Road, approximately 1.75 miles to the southwest.

Roadways

Skyline Boulevard, as discussed in previous sections, is a local road in Oakland and runs adjacent to multiple proposed and connected project areas. These include proposed project area RD004 and connected project area RD008. Skyline Boulevard begins east of SR 24 and continues in an east-southeast direction through various EBRPD parks until it terminates at Grass Valley Road near Anthony Chabot Regional Park.

Redwood Road is a local road in Oakland that generally runs along the southern boundary of Redwood Regional Park. Proposed project area RD009 and connected project area RD009 are adjacent to Redwood Road. Redwood Road connects to SR 13 south of the park and continues along the southern boundary of Redwood Regional Park and the eastern boundary of Anthony Chabot Regional Park.

The following are local roads and the proposed and connected project areas they are closest to.

- Pine Hills Drive (connected RD001)
- Shirley Drive (proposed RD004)
- Wilton Drive (proposed RD004)

Multiple parking facilities are within or near project areas in the park. These include the parking facilities at the Skyline Gate Staging Area, which is within the boundaries of proposed project area RD004 and connected project area RD001. The parking lot at Chabot Space and Science Center is near proposed project area RD005a, and the parking facilities at the Trudeau Center are within the boundaries of connected project area RD008.

Bicycle and Pedestrian Facilities

The Redwood Bike Route traverses an 8.2-mile loop around Redwood Regional Park. Portions of this bike route traverse or run adjacent to multiple proposed and connected project areas. Stream Trail, a hiker and horse-only trail, also serves as a fire road and is within the boundaries of some of the proposed and connected project areas.

According to the City of Oakland Bicycle Master Plan (2007a and 2007b), the Class III bicycle route along Skyline Boulevard is the closest element of the Oakland bicycle network. The street grade along this portion of Skyline Boulevard is relatively flat with between 3 and 6% street grade changes in various locations. Limited pedestrian facilities are available as a result of the hilly terrain and small amounts of pedestrian demand.

Transit Facilities

The following AC Transit lines and stops are near and serve the project areas. They are listed by their location in relation to the project areas from north to south.

- Line 339 – This is a local line, with limited service, running from the Fruitvale BART station to Chabot Space and Science Center. There are four trips in each direction with this route. The closest stop to the project areas is at the terminus, at Chabot Space and Science Center, within 0.5 miles of several parts of the project areas.
- Line 39 – This is a local line running from the Fruitvale BART station to Skyline High School. It operates at approximately 1-hour intervals during the day, stopping service at 7 p.m. The closest stops to the project areas are along Skyline Boulevard, within 0.2 miles of several parts of the project areas.
- Multiple supplementary lines run near the project areas. Most of these lines serve as bus routes for local elementary and high schools during the weekdays. The closest stops for these lines are at various points along Skyline Boulevard. The schools served by these lines include:
    - Bentley School (Line 604)
    - Head Royce High School (Line 604)
    - Hebrew Day School (Line 604)
    - Montera Middle School (Line 655)
    - Oakland Technical High School (Line 696)
    - Skyline High School (Lines 643, 646, 649, 650, and 662) (AC Transit 2012a and 2012b)

Anthony Chabot Regional Park Project Areas
(Proposed AC001, AC002, AC003, AC006, AC007, AC011, AC012, AC013, and AC014; Connected AC001, AC006, AC007, AC010, AC011, AC012, AC013, and AC014)

Anthony Chabot Regional Park is at 9999 Redwood Road in unincorporated Castro Valley; however, there are also several access points to the park along Redwood Road in Oakland. The park can be reached from either the westbound I-580 interchange with Castro Valley Boulevard or the eastbound I-580 interchange with Redwood Road, approximately 2.7 miles to the south.

Roadways

Redwood Road, as discussed in previous sections, is a local road in Oakland that generally runs along the southern boundary of Redwood Regional Park and the eastern boundary of Anthony Chabot Regional Park. Proposed project areas AC001 and AC002 and connected project area AC001 are adjacent to Redwood Road.

Skyline Boulevard, as discussed in previous sections, is a local road in Oakland and runs adjacent to multiple proposed and connected project areas. These include proposed project areas AC006 and AC007 and connected project area AC007. Skyline Boulevard begins east of SR 24 and continues in an east-southeast direction through various EBRPD parks until it ends at Grass Valley Road near Anthony Chabot Regional Park.

Marciel Road is a local road through the Anthony Chabot Regional Park. It begins as a turnoff on Redwood Road near the southern portion of Upper San Leandro Reservoir on the east side of Anthony Chabot Regional Park and continues in a generally south-southwest direction. It serves as a roadway to the many campgrounds throughout the park. Marciel Road runs adjacent and through multiple proposed and connected actions, including proposed project areas AC013 and AC014 and connected project areas AC010 and AC013.

The following are local roads and the proposed and connected project areas they are closest to.

- Clairpointe Way (proposed AC006; connected AC006)
- Gun Range Road (proposed AC014; connected AC010)

The closest parking facilities at the edge of the park are at the Chabot Equestrian Center off Skyline Boulevard at the intersection with Keller Avenue and Clyde Woolridge Staging Area at the intersection of Skyline Boulevard and Grass Valley Road. Both of these parking facilities are within the boundaries of connected project area AC007. There are also multiple parking facilities within the park that are also near and within the boundaries of various project areas. These facilities include the daily use parking off Marciel Road at the Brandon Trailhead (proposed project area AC014) and the parking lot at the Marksmanship Range (connected project area AC010).

Bicycle and Pedestrian Facilities

A section of the 31-mile East Bay Skyline National Trail, running from Richmond to Castro Valley, is in the park. This is a multi-use trail open to hikers, bicyclists, and equestrians. In addition, the park is connected to Cull Canyon Regional Recreation Area by a 6-mile section of the Chabot-to-Garin Regional Trail. Portions of the Lake Chabot Bicycle Loop, a 12.4-mile loop

around Lake Chabot and northeast into the park are within the boundaries of multiple proposed and connected actions.

According to the City of Oakland Bicycle Master Plan (2007a and 2007b), the Class III bicycle route along Skyline Boulevard is the closest element of the Oakland bicycle network. Along this stretch of Skyline Boulevard, the street grade ranges between 3 and 9%. Limited pedestrian facilities are available as a result of the hilly terrain and low amount of pedestrian demand.

Transit Facilities

The following AC Transit Lines and Stops are near and serve the project areas. They are listed by their location in relation to the project areas from north to south.

- Line 39 – This is a local line running from the Fruitvale BART station to Skyline High School. It operates at approximately 1-hour intervals during the day, stopping service at 7 p.m. The closest stops to the project areas are along Skyline Boulevard, within 0.2 miles of several parts of the project areas.
- Multiple supplementary lines run near the project areas. Most of these lines serve as bus routes for local elementary and high schools during the weekdays. The closest stops for these lines are at various points along Skyline Boulevard. The schools served by these lines include:
  - Bentley School (Line 604)
  - Head Royce High School (Line 604)
  - Hebrew Day School (Line 604)
  - Montera Middle School (Lines 655 and 653)
  - Oakland Technical High School (Line 696)
  - Skyline High School (Lines 638, 643, 646, 648, 649, 650, 652, 653, 654, 658, and 662) (AC Transit 2012a and 2012b).

Leona Canyon Regional Open Space Preserve Project Areas (Proposed LE005)

Leona Canyon Regional Open Space Preserve is on Campus Drive off Keller Avenue in Oakland. Access to the preserve is available from a staging area on Campus Drive off Keller Avenue.

Roadways

The main entrance to Leona Canyon Regional Open Space Preserve is off Campus Drive on the west side of the preserve, which is opposite the location from the proposed project area (LE005). The closest access points to the proposed project area are at Lexford Place or Graham Place immediately off of Skyline Boulevard.

Skyline Boulevard, as discussed in previous sections, is a local road in Oakland and runs adjacent to multiple proposed and connected project areas. In the vicinity of the project areas, Skyline Boulevard has two lanes in each direction and operates as a medium-speed parkway.

Parking is available at the nearby Merritt College parking lot; however, it charges a fee and is closed on weekends. Limited on-street parking is available along Canyon Oaks Drive.

Bicycle and Pedestrian Facilities

The Artemisia Trail traverses the proposed project area in Leona Canyon Regional Open Space Preserve. This is a multi-use trail for hikers, bicyclists, and horses and can be accessed from Lexford Place, off Skyline Boulevard. According to the City of Oakland Bicycle Master Plan (2007a and 2007b), the Class III bicycle route along Skyline Boulevard is the closest element of the Oakland bikeway network. Limited pedestrian facilities are available as a result of the hilly terrain and small amounts of pedestrian demand.

Transit Facilities

There are no local AC Transit lines running near the proposed project area; however, there are multiple nearby supplementary lines. Most of these lines serve as bus routes for local elementary and high schools during the weekdays. The closest stops for these lines are at various points along Skyline Boulevard. The schools served by these lines include:

- Bentley School (Line 604)
- Head Royce High School (Line 604)
- Hebrew Day School (Line 604)
- Skyline High School (Lines 646, 649, 650, and 652)

Lake Chabot Regional Park Project Areas (Proposed LC010)

Lake Chabot Regional Park is at 17600 Lake Chabot Road in Castro Valley and can be reached from the I-580 interchange with Fairmont Drive, approximately 1.75 miles to the west of the Lake Chabot Regional Park main entrance in San Leandro. There is also access to the park from I-580 in Castro Valley via Strobridge Avenue and Redwood Road.

Roadways

Proposed project area LC010 is nearest to Hillsborough Drive, a local road in Castro Valley. Various paths along neighborhood streets from Lake Chabot Road, Seven Hills Road, or Redwood Road can reach this roadway.

One off-street parking facility is near the proposed and connected project areas, at the Lake Chabot Marina, which requires payment of a parking fee. However, a substantial amount of on-street parking is available for visitors along Fairmont Drive near the main entrance.

Bicycle and Pedestrian Facilities

The Lake Chabot Bicycle Loop covers approximately 12.4 miles via the Live Oak Trail, and around 14.4 miles via the Honker Bay Trail. All fire roads in the park are open to mountain bikes unless otherwise noted. However, narrow single-track trails are closed to bicycles.

The closest bicycle route is the Ten Hills Trail along the southern boundary of Lake Chabot Regional Park.

Minimal pedestrian facilities are available as a result of the hilly terrain and limited amounts of pedestrian demand, except for within the park itself, where many trails are available. Most pedestrians arrive to the park as vehicular passengers. There is a pedestrian sidewalk available along the eastbound side of Fairmont Drive.

Transit Facilities

The following AC Transit lines and stops are the closest lines to the project areas; however, the closest stop is approximately 1 mile from the project area boundary. They are listed by their location in relation to the project area from north to south.

- Line NX4 – This is a Transbay line running from Castro Valley Park and Ride to the Temporary Transbay Terminal in downtown San Francisco. This bus line offers six trips from Castro Valley to San Francisco service during the morning commute period and five trips back to Castro Valley from San Francisco during the evening commute period. The closest stops to the project area are along Seven Hills Road, about 1 mile from the project area.
- Line NXC – This is a Transbay line running from the Temporary Transbay Terminal in downtown San Francisco to the Castro Valley Park and Ride via I-580, providing evening commute bus service from San Francisco only; morning commute travel to San Francisco at stops along the NXC service is provided via lines NX, NX3, and NX4. The closest stops to the project area are along Seven Hills Road, about 1 mile from the project area (AC Transit 2012a and 2012b).

4.14.3.1.3 UCB Projects

The UCB campus can be reached by exiting I-80 at University Avenue and heading east until Oxford Street. There are many access points onto the main portions of the campus from Oxford Street to the west, Bancroft Avenue to the south, and Hearst Avenue to the north.

Strawberry Canyon-PDM

The Strawberry Canyon-PDM is a pre-disaster mitigation proposed project area within the upper portions of Strawberry Canyon, substantially uphill and east of the main UCB campus and near the Lawrence Berkeley National Laboratory. It can be accessed primarily by Grizzly Park Boulevard, which connects with the Berkeley and Oakland portions of the East Bay Hills, and Centennial Drive through the UCB campus.

Roadways

Grizzly Peak Boulevard is a collector road in Berkeley and runs from near the southern boundary of Wildcat Canyon Regional Park and south adjacent to and through Tilden Regional Park. It eventually continues south into other EBRPD parks. It serves as the northern border and primary access point of this proposed project area.

Centennial Drive is a local road on the UCB campus. It serves as an access route from the main campus near California Memorial Stadium to the south and to Grizzly Peak Boulevard to the north. The northern portion of Centennial Drive is within the Strawberry Canyon-PDM.

Gauss Way is another short local road on the UCB campus within the Strawberry Canyon-PDM. It is a dead-end road beginning at Centennial Drive and heading south for approximately 0.13 miles to the Space Sciences Laboratory and the Mathematical Sciences Research Institute.

According to the UCB Parking and Transportation Department maps (UCB 2012), the following are the closest public parking facilities to the Strawberry Canyon-PDM. These are available to the public during the weekdays after 5:00 p.m. and on weekends except during special events.

- Space Sciences Access Road (25 spaces)
- Space Sciences Laboratory Lot (29 spaces)
- Space Sciences Laboratory – Upper Lot (39 spaces)

Due to the hilly and steep nature of the adjacent roadways, no on-street parking is available near the proposed project area within the Strawberry Canyon-PDM. Some unsigned and unmarked on-street parking was observed along Grizzly Peak Boulevard, where some employees or staff at UCB facilities park.

Bicycle and Pedestrian Facilities

The entire UCB campus is very accessible to bicyclists and pedestrians, but most bicycle and pedestrian traffic is limited to the lower main campus. Due to the steep climb to the Strawberry Canyon-PDM proposed project area, there is limited bicycle and pedestrian traffic. Pedestrians in the area are usually walking a short distance from the parked vehicle to their destination. Some sidewalks are available for pedestrians immediately adjacent to the Lawrence Hall of Science. However, no bicycle lanes or pedestrian facilities are in the Strawberry Canyon-PDM project area.

Transit Facilities

The following AC Transit lines serve the project area.

- Line 67 – This is a local line running from the Downtown Berkeley BART station to Grizzly Peak Boulevard and Spruce Street, providing transit service to the Berkeley portion of the East Bay Hills. It operates at approximately 40-minute intervals. During the weekends, it also serves Tilden Regional Park. The stop closest to the project area is at Grizzly Peak Boulevard and Shasta Road, about 0.7 miles away.
- Line 65 – This is a local line running from the Downtown Berkeley BART station to Lawrence Hall of Science or Senior Avenue via Hearst Avenue, Euclid Avenue, and Grizzly Peak Boulevard. It also provides transit service to the Berkeley portion of the East Bay Hills and operates at approximately 30-minute intervals. The closest stop to the project area is at the Lawrence Hall of Science and other stops along Centennial Drive and Grizzly Peak Boulevard, less than 0.2 miles away from the project area.

In addition, UCB's local transit system, Bear Transit, provides 30-minute interval service near the proposed project area via the H (Hill) line. This line runs from the Downtown Berkeley BART station to the Space Sciences Laboratory/Mathematical Sciences Research Institute along Centennial Drive and serves campus stops, such as Evans Hall and the UCB Botanical Garden. The closest stops to the proposed and connected project areas are at the Lawrence Hall of Science and the Space Sciences Laboratory, along Centennial Drive and Gauss Way (AC Transit 2012a and 2012b), which is within the project area.

Claremont-PDM

Claremont-PDM is a proposed project area in Oakland south and southeast of the Frowning Ridge-PDM proposed project area and several Tilden Regional Park proposed and connected project areas. It is north and east of EBRPD's Claremont Canyon Regional Preserve proposed and connected project areas. It can be accessed primarily by Claremont Avenue, which connects the Rockridge neighborhood of northern Oakland with the upper Oakland portions of the East Bay Hills.

Roadways

Claremont Avenue is an arterial road in Oakland and runs along the eastern boundary of the project area. It begins at the intersection with Telegraph Avenue in the south and continues generally in a northeast direction uphill until it ends at Grizzly Peak Boulevard.

No public parking facilities or on-street parking spaces are within or near the proposed project area.

Bicycle and Pedestrian Facilities

According to the City of Oakland Bicycle Master Plan (2007a and 2007b), the proposed Class III bicycle lane along Claremont Avenue is the closest element of the Oakland bicycle network. There is an extremely steep 800-foot grade change over a half mile along the section of Claremont Avenue closest to Claremont-PDM.

As with many of the other project areas, there are no pedestrian facilities due to the steep and hilly nature of the area and the lack of substantial pedestrian demand.

Transit Facilities

No AC Transit lines or stops serve Claremont-PDM (AC Transit 2012a and 2012b).

Frowning Ridge-PDM

Frowning Ridge-PDM is a proposed project area east of Strawberry Canyon-PDM within the Oakland's jurisdiction but would be implemented and maintained by UCB under contract with the city. It is located immediately south and southeast of several Tilden Regional Park proposed and connected project areas. It can be accessed primarily by Grizzly Park Boulevard.

Roadways

Grizzly Peak Boulevard is the main roadway within the project area and eventually continues south into other EBRPD parks, following the outline of the westernmost ridge along the East Bay Hills.

No public parking facilities or on-street parking are within or near the proposed project area.

Bicycle and Pedestrian Facilities

According to the City of Oakland Bicycle Master Plan (2007a and 2007b), the Class III bicycle route along Grizzly Peak Boulevard is the closest element of the Oakland bicycle network. As with many of the other project areas, there are no provisions of additional pedestrian facilities due to the steep and hilly nature of the area and the lack of substantial pedestrian demand.

Transit Facilities

No AC Transit lines or stops serve the project area (AC Transit 2012a and 2012b).

4.14.3.1.4 City of Oakland Projects

Oakland is served by several major roadways near the proposed and connected project areas, including I-580, SR 13, and SR 24. AC Transit provides local bus service, and there are several BART stations. Several of the proposed and connected project areas, including the Tilden Regional Park area, Sibley Volcanic Regional Preserve, and the Claremont Canyon-Stonewall area, are in, overlap with, or coincide with other EBRPD or UCB proposed actions and have been previously discussed.

North Hills-Skyline-PDM

North Hills-Skyline-PDM is a proposed project area in Oakland, east of the EBRPD Claremont Canyon Regional Preserve, south of Claremont-PDM, and north and east of the EBRPD's Claremont Canyon Regional Preserve project areas. It can be accessed primarily by Grizzly Park Boulevard.

Roadways

Grizzly Peak Boulevard is the main access point to the North Hills-Skyline-PDM proposed project area and serves as its northern border. It eventually continues south into other EBRPD parks, following the outline of the westernmost ridge along the East Bay Hills.

Other local roads near the proposed project area include Westmoorland Drive, Buckingham Boulevard, Tunnel Road, and Bay Forest Drive.

The project also crosses SR 24 over Caldecott Tunnel. Since the freeway crosses the project area as an underpass tunnel, it would not be affected by the proposed actions.

There are no public parking facilities or on-street parking spaces near or within the boundaries of the proposed project area.

Bicycle and Pedestrian Facilities

According to the City of Oakland Bicycle Master Plan (2007a and 2007b), the Class III bicycle routes along Grizzly Peak Boulevard and Tunnel Road/Skyline Boulevard are the closest elements to the Oakland bicycle network.

As with many of the other project areas, there are no provisions of additional pedestrian facilities due to the steep and hilly nature of the area and the lack of substantial pedestrian demand.

Transit Facilities

AC Transit Line 642 serves the project area. This is a supplementary line running from Skyline Boulevard and Tunnel Road in Oakland to Montera Middle School. The closest stops to the project area are along Tunnel Road, approximately 0.8 miles away from the project area (AC Transit 2012a and 2012b).

Caldecott Tunnel-PDM

Caldecott Tunnel-PDM is a proposed project area in Oakland. It is south of North Hills-Skyline-PDM and west of EBRPD's Sibley Volcanic Regional Preserve project areas. The North Oakland Regional Sports Center is within portions of the proposed project area. It can be accessed primarily by Broadway, which connects downtown Oakland to the south and terminates as a surface street near the Caldecott Tunnel and the proposed project areas in the Caldecott Tunnel-PDM.

Roadways

Broadway is the main access to the Caldecott Tunnel-PDM proposed project area; however, the roadway is not directly adjacent to the project area boundaries. This is an arterial roadway in Oakland and runs mostly parallel and adjacent to SR 24. Broadway ends just north of the project area near the entrance to the Caldecott Tunnel.

There is one public 33-space off-street parking facility near the boundary of the proposed project area at Caldecott Field and the Frank Ogawa Fire Garden. No on-street parking is available along Broadway in the immediate vicinity of the proposed project area.

Bicycle and Pedestrian Facilities

According to the City of Oakland Bicycle Master Plan (2007a and 2007b), the proposed Class II bicycle lanes along Broadway (adjacent to northbound SR 24 and the proposed project area) and Tunnel Road (west of SR 24) are the closest elements of the Oakland bicycle network. The lane along Broadway would have an average gradient of approximately 7% near the proposed project area.

A sidewalk is available along the west side of Broadway from the Caldecott Tunnel to the SR 13 overpass. This sidewalk serves recreational pedestrians and other users.

Transit Facilities

The project area is served by one AC Transit route, Line E. This route is a Transbay line running from Caldecott Lane and Tunnel Road to the Temporary Transbay Terminal in San Francisco via

Tunnel Road, Claremont Avenue, and SR 24. This bus line offers four trips from Oakland to San Francisco service during the morning commute period and one trip during the evening commute period. There are four morning commute trips to Oakland from San Francisco and five trips during the evening commute period. The closest stop to the project area is at Caldecott Lane and the SR 24 overpass connecting to Broadway, about 0.4 miles from the project area (AC Transit 2012a and 2012b).

4.14.3.2 Planned Improvements

The EBRPD and other agencies with jurisdiction over portions of the project area generally plan to maintain and/or expand recreational and open space areas, so additional trails and other transportation improvements would likely occur in the future. However, due to the built-out nature of the areas surrounding the proposed and connected actions, the steep nature of the nearby terrain and space, and the designation of the proposed and connected project areas as park and recreational spaces, the number of new roadway projects and/or major transportation improvements within and adjacent to the project area is expected to be minimal. Planned improvements in individual jurisdictions are described below in more detail.

4.14.3.2.1 EBRPD

The EBRPD released a draft 2012 Master Plan for public comment in September 2012, which describes the EBRPD's priorities and plans for future improvement of parks, including roadways, trails, transit stops, and parking for at least the next decade. It highlights and recognizes the need for continued equity of access to the parks, particularly given their remote nature and distance from urban centers. This includes coordination with local transit routes and accenting trailhead entrances with signs (EBRPD 2012d). The Master Plan Existing and Potential Parklands and Trails Map (EBRPD 2007) shows several new and/or expanded trails in the project area. In addition, individual land use plans are being developed for individual parks in the EBRPD system to evaluate park resources and identify future improvements. However, at this time, none of the parks included in the proposed or connected project areas has proposed a revised land use plan.

Policy statements within the draft 2012 Master Plan (2012d) related to park access and transportation/ circulation include:

- Cooperating with regional planning efforts related to walkable communities
- Coordinating access with local trails and bicycle paths to promote "green transportation access" to EBRPD parks and trails
- Providing alternatives to the use of neighborhood street parking where feasible, including construction of additional parking facilities
- Improving existing trails and facilities to comply with the requirements of the Americans with Disabilities Act and the current edition of the California State Parks Accessibility Guidelines
- Monitoring access routes from public transit stops to parks and encourage local agencies to make recommended improvements

- Designing new and existing trails to accommodate a variety of users, including pedestrians/hikers, equestrians, and bicyclists

4.14.3.2.2 Alameda County

The portion of the project area in Alameda County is in the unincorporated community of Castro Valley. The overall transportation goal identified in the Castro Valley General Plan is to provide a multi-modal transportation system that is integrated with land uses in the area and provides residents with options on how to get to their destinations. Transportation improvements focus on streetscaping, bicycle and pedestrian improvement and safety projects, and traffic signal timing. As almost all of the undeveloped areas near Castro Valley and the project areas are owned by cities, counties, and regional park districts as parkland and open space, there is little space for additional development of the area. Therefore, there are no immediate projects identified for realigning or roadway widening.

According to the Alameda County Bicycle Master Plan for Unincorporated Areas, Class II bike lanes are proposed on Lake Chabot Road in Lake Chabot Regional Park leading to the adjacent residential community (County of Alameda 2006a). In addition, the Castro Valley General Plan identifies that AC Transit Castro Valley Transbay bus stop access improvements are planned along Lake Chabot Road, which is designated as an arterial roadway.

4.14.3.2.3 Contra Costa County

The main goal of the Contra Costa County General Plan is to provide an integrated, multi-modal transportation system to safely and efficiently meet the transportation needs of all economic and social segments of the County and provide for the transport of goods and services throughout Contra Costa County. The plan emphasizes the efficient use of existing transportation facilities and cost-effective enhancements to accommodate existing and planned land use.

Some new roadways are planned in the county as a whole; however, due to the built-out nature of the communities of Kensington and Hansford Heights adjacent to the project area, transportation improvements would likely be focused on enhancement of existing facilities, not construction of new streets. No planned transportation improvements were identified in or adjacent to the portions of the proposed and connected actions in Tilden Regional Park. Improvements identified in other portions of the project area in unincorporated Contra Costa County are discussed below.

Roadway improvements are planned along San Pablo Dam Road in the vicinity of Wildcat Canyon Regional Park, including the inclusion of a planned Class II/Class III bicycle route around the park. A Class II bicycle route is also proposed along Canon Drive, extending eastward into the park and connecting with the Wildcat Creek Trail, another Class II bicycle lane. In addition, Class I and Class II bicycle paths and lanes are proposed to extend north-south along the western perimeter of Wildcat Canyon Regional Park (County of Contra Costa 2005a).

4.14.3.2.4 City of Richmond

The main policies of the City of Richmond's Draft 2030 General Plan are to provide a multi-modal transportation system with equitable access, improving and finishing connections to the

existing street system, and encouraging alternative modes of travel, including transit and biking, such as multi-use trails near the shoreline and other parks. Additionally, the plan highlights the need to increase safety for all users of the transportation system, particularly for transit riders, bicyclists, and pedestrians, throughout the city.

According to the Draft 2030 General Plan, the City of Richmond is proposing a Class I bicycle path near the Sobrante Ridge Regional Preserve, connecting as a recreational trail toward the San Pablo Reservoir. The bike route would also connect with a 4-foot-wide striped Class II bicycle lane along Castro Ranch Road to the south of the preserve along with the aforementioned proposed Class II bicycle lane along San Pablo Dam Road. The EBRPD is also planning a connector trail from Kennedy Grove to Sobrante Ridge, which also would connect to the East Bay Skyline Trail in Tilden and Wildcat Canyon Regional Parks.

West Cutting Boulevard is designated as a planned transit priority street in the City of Richmond General Plan. Additional Class I bicycle paths are also proposed near and within the Miller/Knox Regional Shoreline, close to Point Potrero and along southern portions of the shoreline next to the San Francisco Bay. Completion of portions of the Bay Trail in the Miller/Knox Regional Shoreline is also proposed in the general plan (City of Richmond 2011a).

4.14.3.2.5 City of El Cerrito

The City of El Cerrito highlighted goals of providing a balanced transportation system with access to regional connections via transit and bicycle, improving circulation for pedestrians, bicycles, and goods movement, and discouraging the use of residential streets as cut-through traffic streets during commute periods. Additionally, the plan emphasizes the need to create a bicycle master plan and focus on better managing parking requirements, especially around BART stations (City of El Cerrito 1999).

No roadways or projects were identified to be in the vicinity of the proposed and connected project areas within the City of El Cerrito.

4.14.3.2.6 City of Berkeley

The City of Berkeley General Plan is focused on encouraging alternative transportation by maintaining and improving public transportation, slowing and calming traffic in residential areas, maintaining and improving existing infrastructure, improving parking, and creating a safe environment for bicycles and pedestrians (City of Berkeley 2001c). Because areas of the proposed and connected project areas in Berkeley are near residential areas, future projects would likely be limited to regular maintenance, traffic calming projects, and bicycle/pedestrian improvements.

No planned transportation improvements were identified in or adjacent to the portions of the project in Tilden Regional Park.

4.14.3.2.7 City of Oakland

The City of Oakland General Plan includes policies to create a comprehensive and sustainable transportation system that provides multi-modal facilities and accommodates the large percentage of the population without access to automobiles. The focus of the plan is to

implement transportation improvements strategically with land use, expand transit options in the city and to neighboring areas, and create safe and accessible bicycle and pedestrian facilities (Oakland 1998).

Portions of Oakland in the project area are primarily open space and residential uses, and therefore, future transportation projects likely would be limited to regular maintenance and transit, bicycle, and pedestrian improvements. No planned transportation improvements were identified in or adjacent to the portions of the project area in Huckleberry Botanic Regional Preserve, Tilden Regional Park, or Grizzly Peak Open Space.

According to the Alameda County Bicycle Master Plan for Unincorporated Areas, a Class III bike route is proposed for Redwood Road in proximity to Anthony Chabot Regional Park. In addition, Redwood Road is a proposed Class III bicycle route in proximity to Redwood Regional Park.

Class II bike lanes are proposed on Claremont Avenue within the Claremont Canyon Regional Preserve, connecting with the existing Class III bicycle route along Grizzly Park Boulevard (County of Alameda 2006a).

For related pedestrian improvements, a new trail is proposed connecting through the Leona Canyon Regional Open Space Preserve from Knowland Park in Oakland to Redwood Regional Park, as shown in the EBRPD Master Plan (County of Alameda 2006b).

Caltrans, in cooperation with CCTA and Alameda County Congestion Management Agency, are currently constructing improvements to SR 24 adjacent to a portion of the Caldecott Tunnel-PDM for Oakland. The project includes boring of a fourth tunnel and improvements to SR 24 between the tunnel and SR 13 (Caltrans 2012a).

4.14.3.2.8 UCB

According to the UCB 2020 Long Range Development Plan, no specific plans for improvements were identified for the Strawberry Canyon-PDM and Frowning Ridge-PDM proposed project areas within UCB property. However, due to the constraints of the main lower campus, future expansion of the UCB campus could potentially include this area. Improvements and expansion of the campus would require additional roadway and/or pedestrian access and parking as well as substantial regrading of the property due to the steep and hilly nature of the surrounding terrain (UCB 2005).

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4.15 Noise

This section includes a discussion of the federal, state, and local noise standards applicable to the proposed and connected actions and no action alternative. Current noise conditions are also discussed based on typical noise levels associated with noise environments similar to those adjacent to the proposed and connected project areas.

4.15.1 Regulatory Setting

Federal, state, and local governments have requirements applicable to noise generated by the proposed and connected actions.

4.15.1.1 Federal

4.15.1.1.1 National Environmental Policy Act (42 U.S.C. Section 4321 et seq.)

NEPA requires consideration of potential environmental effects, including potential effects on the existing noise environment, of any proposed federal agency action. NEPA obligates federal agencies to consider the environmental consequences of their actions as part of the planning process. General NEPA procedures are set forth in the Council on Environmental Quality (CEQ) regulations in 40 CFR Parts 1500 to 1508 and the FEMA regulations in 44 CFR Part 10.

4.15.1.2 State

4.15.1.2.1 California Noise Control Act

The California Noise Control Act, enacted in 1973 (Health and Safety Code § 46010 et seq.), requires the Office of Noise Control in the Department of Health Services to help local communities develop local noise control programs and work with the Office of Planning and Research to provide guidance for preparing the noise elements of city and county general plans, pursuant to Government Code § 65302(f). In preparing the noise element, a city or county must identify local noise sources and analyze and quantify, to the extent practicable, current and projected noise levels for various sources, including highways and freeways; passenger and freight railroad operations; rapid transit systems; commercial, general, and military aviation, and airport operations; and other stationary noise sources.

4.15.1.3 Regional and Local Regulatory Framework

Counties and cities in California prepare general plans with noise elements, and many also have noise ordinances. Noise elements typically contain noise levels considered compatible with categories of land use. Noise ordinances often contain specific allowable noise levels for different defined circumstances. Many noise ordinances for cities and counties in the East Bay Hills include restrictions on construction hours, and some have numerical limits on construction noise levels. Local noise ordinances are discussed in more detail in Section 4.15.5.

4.15.2 Methodology

Temporary operational noise and noise associated with additional traffic from the proposed and connected actions are the two noise issues addressed in this EIS. Temporary operational noise

would result from the equipment used to remove vegetation, move it to landings, cut it up, and redistribute it within the project area or haul it away. The total amount of noise generated by the equipment in the proposed and connected project areas was calculated using a formula that attenuates noise over a given distance due to wave divergence. The proposed and connected actions may also temporarily cause an increase in traffic near the project areas and may result in higher noise levels at nearby homes and other noise-sensitive land uses. Existing traffic conditions were compared to projected conditions during project implementation to determine if an increase in traffic would result in an increase in traffic noise. The results of this comparison are discussed in Section 5.14.

4.15.3 Fundamentals of Noise

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that interferes with or disrupts normal activities. The effects of noise on people can be grouped into four general categories:

- Subjective effects (dissatisfaction, annoyance)
- Interference effects (interference with communication, sleep, and learning)
- Physiological effects (startle response)
- Physical effects (hearing loss)

Although exposure to high noise levels has been demonstrated to cause physical and physiological effects, the principal human responses to typical environmental noise exposure are related to subjective effects and interference with activities. The subjective responses of individuals to similar noise events are diverse and influenced by many factors, including the type of noise, the perceived importance of the noise, its appropriateness to the setting, duration of the noise, the time of day and the type of activity during which the noise occurs, and individual noise sensitivity.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Sound is generally characterized by several variables, including frequency composition and amplitude. Frequency describes the sound's pitch (tone) and is measured in cycles per second, or Hertz (Hz), whereas amplitude describes the sound's pressure (loudness). Because the range of sound pressures that occur in the environment is extremely large, it is convenient to express these pressures on a logarithmic scale that compresses the wide range of pressures into a more useful range of numbers. The standard unit of sound measurement is the decibel (dB).

Frequency is a measure of how many times each second the crest of a sound pressure wave passes a fixed point, and the units are presented in Hz. Sound levels are expressed by reference to a specific national/international standard. The sound pressure level (SPL) is used to describe sound pressure (loudness) and is specified at a given distance from the source or specific receptor location. In expressing sound pressure level on a logarithmic scale, sound pressure (dB) is referenced to a standard pressure of 20 micropascals (µPa). SPL depends not only on the power of the source but also on the distance from the source to the receiver and the acoustical characteristics of the sound propagation path (e.g., absorption, reflection).

Atmospheric absorption also influences the sound levels received by an observer. The greater the distance traveled, the greater the influence of the atmosphere and the resultant fluctuations. Atmospheric absorption becomes important at distances greater than 1,000 feet. The degree of absorption varies depending on the frequency of the sound as well as the humidity and temperature of the air. For example, atmospheric absorption is lowest (i.e., sound carries further) at high humidity and high temperatures and lower frequencies are less readily absorbed (i.e., sound carries further) than higher frequencies. Over long distances, lower frequencies become dominant as the higher frequencies are more rapidly attenuated. Turbulence, gradients of wind, and other atmospheric phenomena also play a substantial role in determining the degree of attenuation. For example, certain conditions, such as temperature inversions, can channel or focus the sound waves, resulting in higher noise levels than would result from simple spherical spreading.

The most common method used to quantify environmental sounds consists of evaluating all frequencies of a sound according to a weighting system that is reflective of human hearing characteristics. Human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This process is termed “A-weighting,” and the resulting dB level is termed the “A weighted” decibel (dBA).

Because A-weighting is designed to emulate the frequency response characteristics of the human ear and reflect the way people perceive and respond to sound, it is widely used in local noise ordinances and state and federal guidelines, including those of the State of California, the County of Alameda, and the City of Oakland (Oakland). Unless specifically noted, the use of A-weighting is always assumed with respect to environmental sound and community noise even if the notation does not show the “A.”

Although dBA may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most ambient environmental noise includes a mixture of noise from nearby and distant sources that creates an ebb and flow of sound, including some identifiable sources plus a relatively steady background noise in which no particular source is identifiable. Table 4.15-1, Typical Noise Levels, summarizes sound levels from various indoor and outdoor activities.

4.15.4 Noise Descriptors

A single descriptor termed the equivalent sound level (L_{eq}) is used to describe sound that is constant or changing in level. L_{eq} is the energy-mean dBA during a measured time interval. It is the equivalent sound level produced by a given constant source equal to the acoustic energy contained in the fluctuating sound level measured during the interval. In addition to the energy-average level, it is often desirable to know the acoustic range of the noise source being measured. This is accomplished through the maximum L_{eq} (L_{max}) and minimum L_{eq} (L_{min}) indicators, which represent the root-mean-square (RMS) maximum and minimum noise levels measured during the monitoring interval. The L_{min} value obtained for a particular monitoring location is often called the acoustic floor for that location.

The day-night average sound level (L_{dn} or DNL) represents the average sound level for a 24-hour day and is calculated by adding a 10-dBA penalty to sound levels during nighttime (10:00 p.m.

to 7:00 a.m.). The L_{dn} is the descriptor of choice used by nearly all federal, state, and local agencies throughout the United States to define acceptable land use compatibility with respect to noise. The State of California has adopted the community noise equivalent level (CNEL), which is similar to L_{dn}, except that an additional 5-dB penalty is applied to the evening hours (7:00 p.m. to 10:00 p.m.). Because of the time-of-day penalties associated with the L_{dn} and CNEL descriptors, the L_{dn} or CNEL dBA value for a continuously operating sound source during a 24-hour period would be numerically greater than the dBA value of the 24-hour L_{eq}. Thus, for a continuously operating noise source producing a constant noise level operating for periods of 24 hours or more, the L_{dn} would be 6 dB higher than the 24-hour L_{eq} value. To provide a frame of reference, common sound levels are presented in Table 4.15-1, Typical Noise Levels.

Table 4.15-1. Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
Threshold of pain	120	Threshold of pain
	110	Rock band
Jet flyover at 1,000 feet		
	100	
Gas lawnmower at 3 feet		
	90	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80	Garbage disposal at 3 feet
Noise urban area, daytime		
Gas lawnmower, 100 feet	70	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60	
		Large business office
Quiet urban daytime	50	Dishwasher in next room
Quiet urban nighttime	40	Theater, large conference room (background)
Quite suburban nighttime		
	30	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20	
		Broadcast/recording studio
	10	
Threshold of hearing	0	Threshold of hearing

Source: Caltrans 2009

To describe the time-varying character of environmental noise, the statistical or percentile noise descriptors L_{10}, L_{50}, and L_{90} may be used. These descriptors are the noise levels equaled or exceeded during 10%, 50%, and 90% of the measured time interval. Sound levels associated with L_{10} typically describe transient or short-term events, such as car and truck pass-bys. Sound levels are higher than this value only 10% of the measurement time. L_{50} represents the median sound level during the measurement interval. Levels would be above and below this value exactly one-half of the measurement time. L_{90} is the sound level exceeded 90% of the time; therefore, it is often used to describe background noise conditions because it typically represents generators of continuous sound and the aggregate of distant background environmental noise.

4.15.5 Local Noise Standards

Local noise guidelines are often based on the broader guidelines of state and federal agencies and many are implemented as enforceable noise ordinances. Local standards applicable to the proposed and connected actions are presented in this section.

4.15.5.1 Alameda County

The Alameda County Noise Ordinance (County of Alameda 2005) establishes exterior noise standards for the county, as shown in Tables 4.15-2 and 4.15-3. The standards are stated as allowable minutes of exposure to different sound levels within any 1 hour. Compliance is determined at the property line. The noise standards in Table 4.15-2 apply to sound affecting noncommercial properties, including residences, schools, hospitals, churches, and public libraries. The noise standards in Table 4.15-3 apply to sound affecting commercial properties. The noncommercial noise standards include 30-minute-per-hour limits of 50 dBA in the daytime and 45 dBA at night. The commercial noise standards include 30-minute-per-hour limits of 65 dBA in the daytime and 60 dBA at night. Impulsive or pure-tone noise is penalized by a reduction of 5 dBA for each noise standard. The standards do not apply to construction noise from 7 a.m. to 7 p.m. Monday through Friday and from 8 a.m. to 5 p.m. on weekends (Alameda County, CA, Code of Ordinances §6.60.070E).

Table 4.15-2. Alameda County Exterior Noise Standards for Sound Affecting Single or Multiple-Family Residences, Schools, Hospitals, Churches, or Public Libraries (dBA)

Cumulative Number of Minutes in Any 1-Hour Period	Corresponding L%	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
30	L_{50}	50	45
15	L_{25}	55	50
5	$L_{8.3}$	60	55
1	$L_{1.7}$	65	60
0	- -	70	65

Source: County of Alameda 2005

dBA = A-weighted decibels

Table 4.15-3. Alameda County Exterior Noise Standards for Sound Affecting Commercial Properties (dBA)

Cumulative Number of Minutes in Any 1-Hour Period	Corresponding L%	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
30	L_{50}	65	60
15	L_{25}	70	65
5	$L_{8.3}$	75	70
1	$L_{1.7}$	80	75
0	- -	85	80

Source: County of Alameda 2005

dBA = A-weighted decibels

4.15.5.1.1 Oakland

The City of Oakland Noise Ordinance establishes the exterior noise limits presented in Tables 4.15-4 through 4.15-6. The Oakland standards are stated as allowable minutes of exposure to different sound levels within any 1 hour. Compliance is determined at the property line. The standards in Table 4.15-4 apply to sound affecting residences and civic properties. The standards include 20-minute-per-hour limits of 60 dBA during the day and 45 dBA at night. The noise standards in Table 4.15-5 apply to sound affecting commercial properties. The standards include a 20-minute-per-hour limit of 65 dBA. The noise standards in Table 4.15-6 apply to industrial and agricultural zones and properties where manufacturing and extraction occur. The standards include a 20-minute-per-hour limit of 70 dBA. Impulsive or pure-tone noise is penalized by a reduction of 5 dBA for each noise standard.

Table 4.15-4. City of Oakland Exterior Noise Level Standards – Residential and Civic (dBA)

Cumulative Number of Minutes in Any 1-Hour Period	Corresponding L%	Daytime Standard (7:00 a.m. to 10:00 p.m.)	Nighttime Standard (10:00 p.m. to 7:00 a.m.)
20	L_{33}	60	45
10	L_{17}	65	50
5	$L_{8.3}$	70	55
1	$L_{1.7}$	75	60
0	- -	80	65

Source: City of Oakland 2008

dBA = A-weighted decibels

Table 4.15-5. City of Oakland Exterior Noise Level Standards – Commercial (dBA)[(1)]

Cumulative Number of Minutes in Any 1-Hour Period	Corresponding L%	Standard
20	L_{33}	65
10	L_{17}	70
5	$L_{8.3}$	75
1	$L_{1.7}$	80
0	- -	85

Source: City of Oakland 2008

dBA = A-weighted decibels

(1) includes the Housing and Business Mix (HBX) Zone

Table 4.15-6. City of Oakland Exterior Noise Level Standards – Manufacturing, Industrial, Agricultural and Extractive (dBA)

Cumulative Number of Minutes in Any 1-Hour Period	Corresponding L%	Standard
20	L_{33}	70
10	L_{17}	75
5	$L_{8.3}$	80
1	$L_{1.7}$	85
0	- -	90

Source: City of Oakland 2008

dBA = A-weighted decibels

Construction noise level standards for Oakland are separated into activities lasting less than 10 days (short-term operation) and 10 days or more (long-term operation). Table 4.15-7 lists the maximum allowable weekday and weekend noise levels for short-term and long-term construction or demolition activities affecting residential, commercial, and industrial zones.

Table 4.15-7. City of Oakland Exterior Noise Standards – Maximum Allowable Noise from Construction (dBA)

	Weekdays (7:00 a.m. to 7:00 p.m.)	Weekends (9:00 a.m. to 8:00 p.m.)
Short-Term Operation		
Residential	80	65
Commercial, Industrial	85	70
Long-Term Operation		
Residential	65	55
Commercial, Industrial	70	60

Source: City of Oakland 2008

dBA = A-weighted decibels

4.15.5.1.2 City of Berkeley

The City of Berkeley Community Noise Ordinance establishes the noise limits in Tables 4.15-8 and 4.15-9. Table 4.15-8 lists the exterior noise level limits, and Table 4.15-9 lists the interior noise level limits. The standards are stated as allowable minutes of exposure to different sound levels within any 1 hour. Compliance is determined at the property line. If the existing noise level exceeds a standard listed in Tables 4.15-8 and 4.15-9, the existing noise level is the noise standard.

Table 4.15-8. City of Berkeley Exterior Noise Standards (dBA)

Zoning District	Time Period	Noise Level (L_{50})	Noise Level (L_{25})	Noise Level ($L_{8.3}$)	Noise Level ($L_{1.7}$)	Noise Level (L_{Max})
R-1, R-2, R-1A, R-2A, and ESR	7:00 a.m. - 10:00 p.m.	55	60	65	70	75
	10:00 p.m. - 7:00 a.m.	45	50	55	60	65
R-3 and above	7:00 a.m. - 10:00 p.m.	60	65	70	75	80
	10:00 p.m. - 7:00 a.m.	55	60	65	70	75
Commercial	7:00 a.m. - 10:00 p.m.	65	70	75	80	85
	10:00 p.m. - 7:00 a.m.	60	65	70	75	80
Industrial	Anytime	70	75	80	85	90

Source: City of Berkeley 2009

dBA = A-weighted decibels
ESR = Environmental Safety-Residential District

Table 4.15-9. City of Berkeley Interior Noise Standards (dBA)

Zoning District	Time Period	Noise Level ($L_{8.3}$)	Noise Level ($L_{1.7}$)	Noise Level (L_{Max})
All	7:00 a.m. - 10:00 p.m.	40	45	50
	10:00 p.m. - 7:00 a.m.	45	50	55

Source: City of Berkeley 2009

dBA = A-weighted decibels

Construction noise level limits for the City of Berkeley are shown in Tables 4.15-10 and 4.15-11. Compliance is determined at the property line. Table 4.15-10 lists maximum allowable noise levels for nonscheduled, intermittent, and short-term (less than 10 days) operation of mobile construction equipment affecting residential, commercial, and industrial properties. Mobile construction equipment is short-term in operation and would be subject to these requirements. Table 4.15-11 lists maximum allowable noise levels for repetitively scheduled and long-term operation (period of 10 days or more) of stationary construction equipment affecting residential, commercial, and industrial properties. Stationary equipment is long-term in operation and would be subject to these requirements.

Table 4.15-10. City of Berkeley Mobile Construction Equipment Noise Standards (dBA)

Time Period	R-1, R-2 Residential	R-3 and above Multi-Family Residential	Commercial/ Industrial
Weekdays 7:00 a.m. - 7:00 p.m. and legal holidays	75	80	85
Weekends 9:00 a.m. - 8:00 p.m. and legal holidays	60	65	70

Source: City of Berkeley 2009

dBA = A-weighted decibels

Table 4.15-11. City of Berkeley Stationary Construction Equipment Noise Standards (dBA)

Time Period	R-1, R-2 Residential	R-3 and above Multi-Family Residential	Commercial/ Industrial
Weekdays 7:00 a.m. - 7:00 p.m. and legal holidays	60	65	70
Weekends 9:00 a.m. - 8:00 p.m. and legal holidays	50	55	60

Source: City of Berkeley 2009

dBA = A-weighted decibels

4.15.5.2 Contra Costa County

Contra Costa County does not have an ordinance that specifically addresses noise from point sources, transportation, or construction (County of Contra Costa 2005e). The closest set of requirements regarding noise can be found in the Temporary Events Ordinance in Chapter 82-44 of the Contra Costa County Municipal Code (County of Contra Costa 2005a). Due to the lack of a noise ordinance and the temporary nature of the proposed and connected actions, the noise standards in the Temporary Events Ordinance were used as reference sound levels.

If a temporary event permit is granted for any event in a residential zoning district or at a residence in any other zoning district, the maximum allowable exterior noise levels found in Table 4.15-12 apply. Amplified sound is prohibited after 8:00 p.m. Sundays through Thursdays and after 10:00 p.m. Fridays, Saturdays, and holidays.

Table 4.15-12. Contra Costa County Temporary Event Maximum Allowable Exterior Noise Levels (dBA)

Cumulative Number of Minutes in Any 1-Hour Period	Corresponding L%	9:00 a.m. to 8:00 p.m.	8:00 p.m. to 10:00 p.m.
30	L_{50}	60	55
10	L_{25}	65	60
5	$L_{8.3}$	70	65
1	$L_{1.7}$	75	70
0	- -	80	75

Source: Contra Costa County 2005a

dBA = A-weighted decibels

4.15.5.2.1 City of Richmond

The City of Richmond noise ordinance establishes exterior noise limits for specific zoning districts, as shown in Table 4.15-13. The noise limits are stated as allowable minutes of exposure to different sound levels within any 1 hour. Impulsive or pure-tone noise is penalized by a reduction of 5 dBA in each noise standard.

The City of Richmond Community Noise Ordinance also addresses noise sources, such as power tools and machinery. In defining acts considered excessive and annoying noises creating a nuisance, the ordinance prohibits, “Operating or permitting the operation of any mechanically powered saw, sander, drill, grinder, leaf blower, lawn or garden tool, or similar tool between 9:00 p.m. and 7:00 a.m. during weekdays, so as to create a noise disturbance across a residential real property line or at any time to violate the applicable noise provisions as set forth in the Richmond Planning Code” (City of Richmond, Code of Ordinances §9.52.050(h)).

Table 4.15-13. City of Richmond Community Noise Ordinance - Maximum Allowable Exterior Noise Levels (dBA)

	Maximum Noise Level in dBA (levels not to be exceeded more than 30 minutes in any hour)		Maximum Noise Level in dBA (level not to be exceeded more than 5 minutes in any hour)
Zoning District	Measured at Property Line or District Boundary	Measured at Any Boundary of a Residential Zone	Between 10:00 p.m. and 7:00 a.m., Measured at Any Boundary of a Residential Zone
Single-Family Residential	60	60	50 or ambient noise level
Multi-Family Residential	65	65	55 or ambient noise level
Commercial	70	60	50 or ambient noise level
Light Industrial and Office-Flex District	70	60	50 or ambient noise level
Heavy and Marine Industrial	75	65	50 or ambient noise level
Public Facilities and Community Use	65	60	50 or ambient noise level
Open Space and Recreational Districts	65	60	50 or ambient noise level

Source: City of Richmond 2011e

dBA = A-weighted decibels

Construction noise limits for the City of Richmond are shown in Tables 4.15-14 and 4.15-15. Compliance is determined at the property line. Table 4.15-14 lists maximum allowable noise levels for nonscheduled, intermittent, and short-term (less than 15 days) operation of mobile construction equipment. Mobile construction equipment used for this project is short term in operation and is subject to these noise standards. Table 4.15-15 lists maximum allowable exterior noise levels for temporary stationary construction equipment.

Table 4.15-14. City of Richmond Mobile Construction Equipment Noise Standards (dBA)

Time Period	SFR-1, SFR-2, SFR-3 Zoning Districts (Single-Family Residential)	MR-1, MR-2, MR-3 Zoning Districts (Multifamily Residential)	Commercial and Industrial Zoning Districts
Weekdays 7:00 a.m. - 7:00 p.m.	75	80	85
Weekends 9:00 a.m. - 8:00 p.m.	60	65	70

Source: City of Richmond 2011e

dBA = A-weighted decibels

Table 4.15-15. City of Richmond Stationary Construction Equipment Noise Standards (dBA)

Time Period	SFR-1, SFR-2, SFR-3 Zoning Districts (Single-Family Residential)	MR-1, MR-2, MR-3 Zoning Districts (Multifamily Residential)	Commercial and Industrial Zoning Districts
Weekdays 7:00 a.m. - 7:00 p.m.	60	65	70
Weekends 9:00 a.m. - 8:00 p.m.	55	60	65

Source: City of Richmond 2011e

dBA = A-weighted decibels

4.15.5.2.2 City of El Cerrito

The City of El Cerrito does not have an applicable noise ordinance.

4.15.6 Sensitive Receptors Near the Proposed and Connected Project Areas

This section includes a description of the sensitive receptors located near the proposed and connected project areas. A sensitive receptor is defined as an area of frequent human use that would benefit from a lowered noise level. Typical sensitive receptors include residences, schools, churches, hospitals, and libraries. Most of the proposed and connected project areas are adjacent to residential subdivisions, and any noise-generating activities within these areas would have the potential to affect sensitive receptors. The exceptions are the Claremont-PDM and Frowning Ridge-PDM proposed project areas, which are not adjacent to any residential areas.

Table 4.15-16 summarizes the schools that are located within the vicinity (less than 1,000 feet) of the proposed and connected project areas. The table also identifies the figure numbers that identify the locations of the various parks and affected polygons.

Table 4.15-16. Schools Near the Proposed and Connected Project Areas

Park/Location	Polygon	Sensitive Receptor	Distance	Figure
Miller/Knox Regional Shoreline	MK002 (proposed)	Washington Elementary School, Richmond	700 feet	3-1a
Wildcat Canyon Regional Park	WC005 (connected)	Riverside Elementary School, San Pablo	450 feet	3-1b
Wildcat Canyon Regional Park	WC011 (proposed)	Kensington Hilltop Elementary School, Kensington	Adjacent	3-1d
		Neighborhood School, Kensington		
Anthony Chabot Regional Park	AC003 (proposed)	Skyline High School, Oakland	Adjacent	3-1h

Several residential areas are adjacent to the following proposed or connection project areas:

- Anthony Chabot Regional Park (Figures 3-1h, 3-1i, and 3-1j)
- Claremont Canyon Regional Preserve (Figure 3-1f)
- Huckleberry Botanic Regional Preserve (Figure 3-1g)
- Lake Chabot Regional Park (Figure 3-1j)
- Leona Canyon Regional Open Space Preserve (Figure 3-1i)
- Miller/Knox Regional Shoreline (Figure 3-1a)
- North Hills-Skyline-PDM (Figure 3-1f)
- Redwood Regional Park (Figures 3-1g and 3-1h)
- Sibley Volcanic Regional Preserve (Figures 3-1f and 3-1g)
- Sobrante Ridge Regional Preserve (Figure 3-1c)
- Strawberry Canyon-PDM (Figure 3-1e)
- Tilden Regional Park (Figures 3-1d and 3-1e)
- Wildcat Canyon Regional Park (Figures 3-1b and 3-1d)

Furthermore, a residential area is within 300 feet of Caldecott Tunnel-PDM (see Figure 3-1f).

4.15.7 Existing Noise Environment

An ambient noise level survey was not conducted for this EIS. The noise environments near the project areas range from quiet wilderness areas to commercial and industrial areas. Quiet wilderness areas with no wind can have ambient noise levels as low as 20 dBA L_{eq}. Suburban areas during the daytime typically have ambient noise levels between 50 and 60 dBA L_{eq} while commercial/urban areas typically have ambient noise levels between 60 and 70 dBA L_{eq} during the daytime. The project area is primarily comprised of suburban land uses, and ambient noise levels are expected to range from 50 to 60 dBA during daytime hours (EPA 1974).

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SECTION FIVE ENVIRONMENTAL CONSEQUENCES AND MITIGATION

This section of the EIS assesses the potential direct and indirect impacts of the proposed and connected actions and the no action alternative on the existing conditions described in Section 4. This section also describes measures to be taken to avoid or mitigate potential adverse impacts of the proposed and connected actions. Potential cumulative impacts are addressed in Section 6.

Avoidance and mitigation measures specifically required by existing laws and regulations are considered part of existing conditions. These measures are discussed in the EIS but may not be included in the lists of avoidance and mitigation measures. Implementation of these legally required measures is assumed.

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5.1 Biological Resources

This section provides an analysis of potential impacts on biological resources from the proposed and connected actions and the no action alternative. Biological resources include vegetation communities, aquatic features, common wildlife species, and wildlife movement and migration corridors. Impacts were evaluated based on activities associated with the proposed and connected actions and the no action alternative that could affect biological resources, using the significance criteria described below. Where potentially significant impacts are identified, mitigation measures are described to avoid and/or reduce these impacts.

The area of analysis includes the areas where the proposed action and the connected actions would occur, including areas identified for treatment, access roads, and staging areas.

This evaluation of potential impacts on biological resources includes federal and state protected wildlife and plant species. In compliance with the federal Endangered Species Act (ESA), a separate Biological Assessment (BA) was prepared for evaluation of potential effects to federally listed species.

5.1.1 Significance Criteria

NEPA requires a discussion of environmental impacts of a proposal and of a reasonable range of alternatives, including the no action alternative. NEPA does not specify federal thresholds of significance for impacts on biological resources, such as threatened and endangered species. However, NEPA requires that draft EISs be prepared concurrently and integrated with environmental analyses and related surveys and studies required by other federal statutes, including the Endangered Species Act (40 CFR 1502.25).

Furthermore, NEPA requires considerations of both context and intensity in determining the significance of potential impacts on a resource. Context means that the significance of an action must be analyzed in the context of the affected region and the locality and not just from a federal perspective. The criterion of intensity means that the analysis must consider unique characteristics of the geographic area, such as proximity to ecologically critical areas and whether the action threatens a violation of federal, state, or local laws or requirements imposed for the protection of the environment (40 CFR 1508.27).

In compliance with these requirements, and in consideration of California Environmental Quality Act (CEQA) Guidelines, impacts on biological resources would be considered potentially significant if the proposed or connected actions would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as an endangered, threatened, candidate, sensitive, or special-status species by the U.S. Fish and Wildlife Service (USFWS) or California Department of Fish and Wildlife (CDFW).
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified by the USFWS or CDFW.

- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

5.1.2 Vegetation Communities

This section describes the potential impacts on vegetation communities from the proposed and connected actions and the no action alternative. As described in Section 4.2.2.2 and listed in Table 4.2-1, 11 vegetation communities are present in the proposed and connected project areas. Of these, northern maritime chaparral is the only locally distinct vegetation community although two other sensitive vegetation communities, serpentine bunchgrass and coastal terrace prairie, occur in small patches. The other vegetation communities include oak-bay woodland, eucalyptus forest, northern coastal scrub, coyote brush scrub, developed/disturbed/landscaped areas, coniferous forest, successional grassland, California annual grassland, riparian woodland, and redwood forest.

5.1.2.1 No Action Alternative

Under the no action alternative, there would be no direct impacts on vegetation communities. However, indirect impacts could occur since greater amounts of non-native and invasive vegetation would remain in the proposed and connected project areas and would compete more strongly with native vegetation communities. The potential for large and intense wildfires would be greater than under the proposed and connected actions, and the potential for severe wildfire impacts on native vegetation communities and habitats would also be greater.

5.1.2.2 Proposed and Connected Actions

The proposed and connected actions are associated with an overall vegetation management goal of conversion of fire prone vegetation communities (e.g., eucalyptus forest) to vegetation communities with lower fire hazard. Through eradication of non-native, invasive, and fire-prone species (eucalyptus, Monterey pine, and acacia), native vegetation communities would experience long-term beneficial effects.

Short-term adverse impacts on other native vegetation communities, such as oak-bay woodland could occur during implementation of the proposed and connected actions through the use of heavy machinery and removal or pruning of some native vegetation. In some areas, the native understory trees and shrubs would be protected during non-native tree removal through the use of hand tools and manual labor rather than mechanized equipment. In other areas, where the vegetation management goals are to enhance habitat for pallid manzanita, native trees and shrubs would be pruned or removed around pallid manzanita plants to allow them to grow unimpeded.

In general, damage to native vegetation communities would be minimized through use of hand labor in some areas, use of existing access roads, and retaining wood chips and placing logs on site for sediment and erosion control. Wood chips would be placed on disturbed areas to a depth of 4 to 24 inches, with lesser amounts placed on slopes or in proximity to watercourses to reduce the potential for chips to be washed into riparian or aquatic areas. Areas disturbed during implementation of the proposed and connected actions would be restored and maintained through

implementation of mitigation and monitoring plans, as described in the following subsections, to prevent long-term impacts to vegetation communities.

5.1.2.2.1 Mitigation and Monitoring Plans (MMPs)

MMPs would be implemented by each subapplicant to address impacts on vegetation communities. MMPs were developed in coordination with permitting agencies, including (but not limited to) USFWS, the U.S. Army Corps of Engineers, the Regional Water Quality Control Board, and the CDFW. The purpose of the MMPs would be to provide treatment performance guidelines and resource protection for each native vegetation type in order to achieve the goals and objectives that are critical to reducing potential hazards from wildfires in the proposed and connected project areas. The MMPs would ensure that the implementation of the vegetation treatments would continue to reduce wildfire risk and promote species habitat by restoring native vegetation communities where applicable.

The MMPs would rely on recruitment of native vegetation into the areas where non-native trees have been removed from the over story canopy. Hydroseeding may be used as an erosion control best management practice, but is not intended to serve as a floral introduction for the purpose of re-vegetation. Rather, hydroseeding would be used as an adaptive management technique in areas at risk of surface erosion from surface rainwater runoff, or in some cases, in areas that fail to establish native vegetative cover under natural recruitment. Seed sources of native grasses, shrubs, and trees are regionally abundant and would be used to assist in the recovery of the areas toward the proposed vegetative goals.

As described in the following subsections, the MMPs include monitoring of vegetation management goals through assessing the succession of vegetation and within each habitat type. Monitoring would be conducted annually, and the results would be addressed in reports submitted to appropriate agencies, including USFWS, on a periodic basis. The reports would include a summary of the maintenance and monitoring activities, recovery, percent cover of federally listed species habitat, measures implemented at each location to aid in the recovery of the habitat toward the vegetation management goal outlined in the plan, and a summary of proposed follow-up action. The report would also include incidental observations of wildlife, comparative photos of the sites, assessment of vegetation criteria attained, and suggestions for future adaptive management.

Vegetation goals and habitat performance standards for the 10-year monitoring period have been developed by each subapplicant, as described in the following subsections. During the 10-year project monitoring period, should success criteria not be achieved at the projected rate, adaptive management practices and additional measures would be implemented to improve progress toward the vegetation management goals. This could include more frequent maintenance projects, new methods or techniques for control, and higher performance objectives for successive years. The adaptive actions would be determined annually through an analysis of data collection and review of photographic documentation. Treatment areas may be assessed individually, and adaptive measures would be implemented to move toward attainment of the vegetation management goals identified for each treatment area.

Draft City of Oakland MMP

While vegetation management is driven by the need for reduction of fire hazard, the Draft City of Oakland MMP also states, "The long range goal is to eradicate French broom, eucalyptus and Monterey pines across the entire ridgeline" and establishes the following performance criteria:

- All invasive tree species would be eradicated by Year 10; the performance criterion would be zero trees of invasive species at the end of 10 years.
- The performance target for noxious, invasive plants would be less than or equal to 40% in Year 1, decreasing in a general linear trend to less than or equal to 20% in Year 10.

The strategy for establishing/restoring native vegetation would be two-pronged. The first set of actions would be aimed at eliminating invasive exotic plants from the site. The second would be to protect and nurture native plants already on the site. Subsequent actions would be comprised of those aimed at encouraging recruitment of native species to the site and limiting the establishment and growth of invasive exotic plants. The City would more aggressively remove invasive exotic species if the coverage is higher than allowed in the performance standards. Performance standards would be achieved through a combination of invasive plant control (to allow space and growing conditions for the establishment and growth of endemic native plants) and through the protection of endemic plants if invasive plant control is not adequate.

The two proposed project areas have very different targets and timelines of changes. In the North Hills-Skyline-PDM project area, the area of eucalyptus trees would change to grass within 3 years. Areas of pine removal would change to scrub, and some of the scrub would succeed into oak-bay woodland.

In the Caldecott Tunnel-PDM project area, the area of eucalyptus would change to grass within 3 years and to successional grassland in the remaining 7 years. Vegetation in any one spot may change over time; however, the proportion of vegetation in the various habitat types throughout the project area (seen as a whole) would be the success criterion.

The methods for measuring performance would include use of maps of existing vegetation, annual onsite monitoring, and aerial photographic measures in Years 3 and 7 to determine the coverage of vegetation types. If in Year 3 the cover of the vegetation does not meet the criterion, actions would be taken as described below to prompt the vegetation to the desired distribution of plants and species.

Non-native invasive plant cover would be calculated from the data collected from all sites. Areas with greater than 20% cover of non-native species considered by the California Invasive Plant Council to be moderately or highly invasive and those with red alerts would be mapped and reported annually. Maintenance activities to control non-native invasive species would be targeted in these areas. Each year, the acreage of mapped highly invasive and alert species would be compared. Additionally, project sites would be visually inspected in the spring with the prior year's non-native invasive species map. If a non-native invasive species population has rapidly spread or a new species has invaded, then maintenance activities likely would be required. The adaptive management process would use the same suite of management methods as used during the initial treatment to control non-native invasive plants.

Draft UCB MMP

The Draft UCB MMP provides interim and long-term success criteria for 10 years for Claremont Canyon, Strawberry Canyon, and Frowning Ridge. Acreage criteria are established for both native and exotic vegetation within each vegetation community to be evaluated at the end of the permit compliance monitoring period. The overall vegetation recruitment and retention goal for native plants is between 70 and 90%, depending upon location and floral community type. The Draft UCB MMP states that success would be achieved if the "native" metrics are attained or exceeded. Therefore, the overall goal is defined as achieving the projected "native/exotic" ratios rather than assuring that succession is proceeding fast enough given uncertainties, such as weather, climate change, pest infestation, diseases, and fires.

Should success criteria not be met, maintenance measures may be implemented more frequently or by use of different maintenance approaches, substituting new methods for those that do not demonstrate adequate efficacy. As the project objective is the eradication of target exotic trees, coppiced (re-sprouted) stumps may be treated in differing methods until 100% mortality is achieved. The latent seed stock is expected to require between 5 and 10 years of continuous treatment to ensure that any naturally germinating exotic trees are removed. Seeds that are carried onto the project areas from adjacent areas (typically upslope) would require treatment until all possible seed sources have been eliminated.

In areas containing other exotic vegetation (e.g. broom) in exceedence of stated goals, the project manager would select from a suite of approaches to achieve annual metrics for each floral community. As unanticipated results are recorded (both positive and negative), these would further inform the project manager such that future maintenance either expands upon successful methods or discontinues those methods found to be unsuitable or ineffective. This process of adaptive management would be employed throughout the project life-cycle.

Draft EBRPD MMP

The Draft EBRPD MMP establishes interim and long-term success criteria for 10 years of monitoring and maintenance. Based on the EBRPD Wildfire Hazard Reduction and Resource Management Plan (WHRRMP), the goals are to reduce fire hazards on EBRPD lands, maintain and enhance ecological values for plant and wildlife habitat consistent with fire reduction goals, preserve aesthetic landscape values, and provide for vegetation management that is cost-effective and sustainable with a diverse and competitive mosaic of native and acceptable non-native vegetation types. The plan focuses on the removal or suppression of invasive and noxious weeds, with three objectives:

1. Controlling weeds, thereby reducing competition for resources by native plants
2. Reducing fuel loads while protecting wildlife habitat and ecosystem preservation
3. Preventing re-establishment of the targeted weeds or invasion of other noxious species

The Draft EBRPD MMP refers to maintenance measures described in the WHRRMP that specifies a post-treatment project review. The EBRPD Stewardship Department has developed a Post-Treatment Assessment process (form) that is deployed within 6 and 12 months of initial

action within a project area. The information collected is compared to the initial prescription and the vegetation management goals to determine the progress of the project toward the success criteria. The prescription is re-evaluated and adapted if necessary to attain the vegetation management goal. Implementation of the plan is a dynamic process where adjustments can be made as needed to continually improve EBRPD's progress toward the goals and objectives identified in this plan.

5.1.2.3 Mitigation Measures

Potential impacts on vegetation communities from implementation of the proposed and connected actions would not be significant with the implementation of MMPs. Specifically, the MMPs have established vegetation management goals with the goal of protecting and promoting native vegetation communities while reducing wildfire risk. Success criteria include requirements for achieving a minimum percent cover of plant species to support native vegetation communities and habitats. Monitoring would be conducted for 10 years, and using an adaptive management approach, additional measures would be implemented to improve progress toward the vegetation management goals if they are not met in the time periods specified in the MMPs. Through eradication of non-native, invasive, and fire-prone species (eucalyptus, Monterey pine, and acacia) and control of other noxious plants as described in the MMPs, impacts on native vegetation communities would be less than significant. Therefore, no mitigation measures would be required.

5.1.3 Aquatic Features

This section describes the potential impacts on aquatic features from the proposed and connected actions and the no action alternative. As described in Section 4.2.2.4, aquatic features within the proposed and connected project areas consist primarily of five creeks (Wildcat, Strawberry, Claremont, San Leandro, and Redwood creeks) and small wetland areas mapped as riparian woodland and associated with the creeks and other unnamed drainages, seeps, and ponds. Figures 4.5-1a through 4.5-1f depict aquatic features in the proposed and connected project areas. Impacts on water resources are discussed in Section 5.4.

5.1.3.1 No Action Alternative

Under the no action alternative, there would be no change to aquatic features in the proposed and connected project areas. However, the potential for high-intensity wildfires would remain and continue to pose a threat to wildlife habitat within aquatic features.

5.1.3.2 Proposed and Connected Actions

During implementation of the proposed and connected actions, a 50-foot buffer around creeks and other watercourses would be established and no mechanized equipment would be used within this 50-foot buffer.

Implementation of these and other standard best management practices would avoid potential adverse impacts on aquatic features, such as erosion of exposed soils or accidental release of hazardous materials (e.g., fuels and oils) to surface waters. However, impacts from the release of herbicides to aquatic features could occur if herbicides are applied directly on surface waters or

close enough such that runoff during precipitation events or wind drift occurs. These impacts would be potentially significant and would require the implementation of mitigation measures, as described in Section 5.1.3.3.2.

5.1.3.3 Mitigation Measures

Mitigation measures would be required during implementation of the proposed and connected actions to avoid and/or reduce potential impacts on aquatic features such that they would not be significant.

5.1.3.3.1 Standard Best Management Practices (BMPs)

Standard best management practices that would be implemented to reduce and control erosion would include (but not be limited to) the following:

- Minimize soil disturbance during and following fuel reduction treatments and inspect disturbed areas for evidence of severe erosion as a result of vegetation management. If severe erosion is occurring at a site, only native plant seeds or stock would be used for erosion control, unless otherwise approved by USFWS. If necessary, fencing, signs, maintenance, access control, jute fabric, sediment traps, mulch, straw wattles (without plastic monofilament netting), vegetation management, exotic species control, or any other commonly used erosion control technique may be used to promote the ecological health of the sites.
- Best management practices (BMPs), as identified by the California Regional Water Quality Control Board, would be implemented to control erosion during and after vegetation removal. Erosion control BMPs would include but may not be limited to:
    - Leaving tree stumps and/or root systems in place until vegetation becomes re-established in logged areas
    - Installing storm drain protection prior to vegetation management for project sites near storm drains
    - Placing a deep bed of chips around tree stumps to allow mechanical skidders to travel above the chip bed
    - Using wood chips and tree trunks retained behind stumps to create sediment traps roughly following the slope contour.
    - Avoiding operation of heavy equipment on slopes steeper than 35% and developing specific measures to minimize effects of erosion if such areas are unavoidable
    - Stabilizing all entrances and exits to control erosion and sediment discharges from the sites
    - Cleaning and maintaining streets and roads in such a manner as to prevent unauthorized non-stormwater discharges from reaching surface water or MS4 drainage systems
    - Selecting mechanical treatments according to a site's topography, access, vegetation type and potential for environmental impacts

- Vehicle and heavy equipment refueling and maintenance would only be permitted in designated disturbed/developed areas where accidental spills can be immediately contained. All project-related heavy equipment would be regularly maintained to avoid fluid leaks (e.g., gasoline, diesel fuel, hydraulic fluid). All leaking fluid would be stopped or captured in a container until such time that the equipment can be immediately moved off site and repaired. Storage of hazardous materials would not occur within 500 feet of any pond or creek drainage. A plan would be prepared for immediate containment and clean-up of hazardous material spills within or adjacent to each site. Further water quality BMPs may include but would not be limited to:
  - Avoiding crossing drainage areas with running or standing water with mechanical equipment while water is present
  - Complying with the National Pollutant Discharge Elimination System (NPDES) stormwater permitting requirements and preparing Stormwater Pollution Prevention Plans (SWPPP)
  - Applying herbicide to tree stumps and re-sprouts by hand during dry weather and low wind conditions
  - Using hand-fellers for trees within 50 feet of a drainage channel; these trees would be felled perpendicular to ephemeral drainages and processing would be done by a skidder if the skidder could safely handle stems at 50-foot distance from drainage, otherwise, the trees would be lopped and scattered by hand fellers
  - Locating landings to accommodate skidding distances of up to 1,000 feet; for landings near streams, residue piles (sawdust, wood chips, etc.) would be placed away from drainages where runoff could wash residue into streams or wetlands
  - Avoiding skidding across dry or running streams; when that is not possible, temporary crossings would be used during the dry season while ephemeral creeks are dry
  - Taking all necessary safeguards to prevent sedimentation into watercourses during all phases of vegetation management activities

5.1.3.3.2 Herbicide Application Mitigation Measures (BR-1)

Mitigation measures would be implemented under the proposed and connected actions to avoid or reduce potential impacts from release of herbicides to aquatic features. Potential mitigation measures would include the following:

- All rules, regulations, best practices, and restrictions as imposed by the California Department of Pesticide Regulation would be followed during herbicide application. In addition, all instructions, restrictions, use limitations disposal methods, and spill remediation methods described on each herbicide label would be followed. The recommended 60-foot no-use zone is based on information obtained from the website http://www.cdpr.ca.gov/docs/endspec/rl_frog/index.htm. This no-use zone was imposed over certain areas by the U.S. District Court for the Northern District of California. Some of these no-use zones intersect with the project area and are intended for the protection of California red-legged frog (CRLF). CRLF habitat may occur throughout the project area;

therefore, it is reasonable to apply similar conditions on herbicide application throughout the project area. The implementation of the 60- foot no-use zone required for protection of CRLF is assumed to be adequately protective of all aquatic receptors that may occur in project area surface waters, including special status species (e.g., salmonid fish) and aquatic prey items important for the survival of special status species.

The key conditions related to herbicide application include:

- Foliar application of herbicides would not be allowed within a 60-foot buffer zone adjacent to ephemeral or permanent surface water bodies.
- Although herbicide transport to surface waters is unexpected with the implementation of BMPs, the more toxic Garlon® 4 Ultra herbicide would not be used in areas with potential for runoff or drift to surface water bodies. In these areas only aquatic-safe formulations of herbicides would be used (e.g. Garlon 3A).
- Herbicides would not be applied within 24 hours of predicted rain events (40% or greater chance for rainfall) to reduce the potential for runoff of herbicides into surface water bodies.
- Herbicides would be applied directly to stumps, and foliar application would not be used in any areas subject to potential drift to surface water bodies.
- Foliar application of herbicides or other spray application methods would not be applied when wind speeds exceed 10 miles per hour (mph) or less than 2 mph to reduce likelihood of drift into surface water bodies.

Herbicide application would consider seasonal migratory patterns and breeding habits of sensitive aquatic organisms. Implementation of these mitigation measures would avoid the potential for herbicides to reach aquatic features and thereby reduce potential impacts on aquatic features such that they would not be significant.

5.1.4 Common Wildlife

This section describes the potential impacts on common wildlife species from the proposed and connected action and the no action alternative. Many species of wildlife utilize the habitats within the proposed and connected project areas, as described in Section 4.2.2.3.

5.1.4.1 No Action Alternative

Under the no action alternative, the potential for high-intensity wildfires resulting from accumulations of vegetative fuel would remain and continue to pose a threat to wildlife populations through direct harm and loss of habitat. In addition, greater amounts of non-native vegetation would continue to compete with native vegetation, thereby reducing the amount of native habitat for common wildlife within the proposed and connected project areas.

5.1.4.2 Proposed and Connected Actions

5.1.4.2.1 Impacts during Implementation

Impacts on common wildlife species and their habitats could occur through the use of heavy machinery that would have the potential to injure and/or kill wildlife that may enter heavy equipment use areas, and there could be temporary impacts from harassment or disturbance due to the presence of humans and increased noise during implementation of treatment actions (removal and thinning of vegetation) in the first 2 years, as well as during the following 7 years of maintenance work. Many wildlife species would be expected to move away or shelter in-place during implementation of the proposed and connected actions such that local populations of common wildlife species would be expected to quickly recover even if the loss of some individuals occurs.

The more mobile wildlife species, such as birds, would be expected to move away from the disturbances created by vegetation treatment activities unless they occur during nesting season. Migratory birds are protected by the Migratory Bird Treaty Act and may nest within vegetation to be removed or pruned during implementation of the proposed and connected action. Removal or disturbance of an active migratory bird nest would result in a significant impact, and mitigation measures, as described in Section 5.1.4.3, would be required to avoid or reduce this potential impact such that it would not be significant.

5.1.4.2.2 Impacts from Habitat Loss or Alteration

Alteration of habitat could result in short-term, significant and unavoidable impacts on common wildlife although the transition of habitats from dense stands of non-native eucalyptus, Monterey pine, and French broom to woodlands, brushlands, and grasslands comprised mostly of native species would benefit wildlife in the long-term.

5.1.4.2.3 Impacts from Herbicide Application

Adverse impacts could occur to common wildlife species from direct contact with and ingestion of herbicides. Impacts from consumption of contaminated prey are considered unlikely given the low bioaccumulation potential of the proposed herbicides. Several BMPs would be implemented to reduce the area affected by herbicides, including focusing the application to cut stumps and limiting foliar application. Cut stump treatment allows substantial control over the site of herbicide application and requires only a small amount of herbicide to be effective. In addition, BMPs would prevent transport of herbicides to surface water bodies via runoff or drift.

Appendix F presents an analysis of ecological risk from the proposed herbicide application. The analysis in Appendix F focuses on five federally listed species (three animals and two plants) as representative surrogates for common species in the project area. It is assumed that protection of the five listed species provides adequate protection of other less sensitive species. This assumption is based on the expectation that the listed species are sufficiently sensitive to the proposed herbicides to serve as surrogates for other less sensitive but closely related species. For example, protection of the CRLF is assumed protective of other amphibians. The risk assessment conducted a very conservative analysis intended to estimate adverse impacts that might occur based on maximum exposed receptor scenarios. Based on the analysis presented in Appendix F,

BMPs are expected to eliminate or reduce exposure for the most important exposure pathways. Therefore, adverse impacts associated with herbicide application on common wildlife species would not be significant.

5.1.4.3 Mitigation Measures

The following mitigation measures would be required to avoid and/or reduce potential impacts on migratory birds such that they are not significant.

5.1.4.3.1 Migratory Birds (BR-2)

- To avoid and minimize disturbance to active nesting or fledging, work during avian nesting and fledging season (February 1 through July 31) would only be undertaken if the treatment area was cleared by an avian biologist.
- If active bird nests are present, a 50-foot non-disturbance zone would be maintained, unless adjustment is approved by the biological monitor (see Section 5.1.6.2.3). If an injured bird is found, the USFWS and the nearest wildlife rehabilitation center would be called.

5.1.5 Wildlife Movement and Migration Corridors

This section describes the potential impacts on wildlife movement and migration corridors under the proposed and connected actions and the no action alternative. As described in Section 4.2.3.4.1, the Caldecott Tunnel Corridor area between the Tilden-Briones region and the Oakland-Las Trampas regions provides an important wildlife corridor for the Alameda whipsnake (AWS) and other species in the East Bay Hills. Other smaller patches of habitat, including riparian corridors along Wildcat Creek and other watercourses, may also function as wildlife movement and migration corridors.

5.1.5.1 No Action Alternative

The no action alternative would not result in significant changes to habitat or to wildlife movement and migration corridors. However, the potential for high-intensity wildfires would remain and continue to pose a threat to wildlife habitat within movement and migration corridors.

5.1.5.2 Proposed and Connected Actions

Implementation of the proposed and connected actions would result in short-term, minor adverse impacts to migration of wildlife. Vegetation management actions would comply with the goal of maintaining native wildlife habitats and corridors. Seasonal restrictions would be employed as much as possible during vegetation treatment activities to avoid migratory periods. Temporary construction fencing and exclosures used as protective measures for wildlife would be removed following implementation of the proposed and connected actions (see Mitigation Measures BR-4 and BR-5), and no permanent fences or barriers to wildlife movement would be installed. Therefore, potential impacts on wildlife movement and migration corridors would not be significant.

5.1.5.3 Mitigation Measures

Potential impacts on wildlife movement and migration corridors from implementation of the proposed and connected actions would not be significant; therefore, no mitigation measures would be required.

5.1.6 Sensitive Biological Resources in the Proposed and Connected Project Areas

This section describes potential impacts on sensitive biological resources under the proposed and connected actions and the no action alternative. Sensitive biological resources include sensitive vegetation communities and special-status wildlife and plant species and critical habitat. Special-status species include federal- and state-listed threatened, endangered, and candidate plant and wildlife species as well as species identified as wildlife species of concern by the California Department of Fish and Wildlife or as rare, threatened, or endangered plants by the California Native Plant Society (CNPS).

5.1.6.1 Sensitive Vegetation Communities

As shown in Table 4.2-2, northern maritime chaparral is the only locally distinct vegetation community identified as sensitive by CDFW that is known to be present in the proposed and connected project areas (also see Figure 4.2-1c and Figure 4.2-1g). In addition, two other sensitive vegetation communities, serpentine bunchgrass and coastal terrace prairie, may occur in small patches in the proposed and connected project areas.

Riparian and wetland habitat also is generally considered sensitive and is present along watercourses, such as Wildcat Creek and Redwood Creek within the proposed and connected project areas. Potential impacts on these aquatic features are discussed in Section 5.1.3, and mitigation measures required to reduce these impacts are presented in Section 5.1.3.3.

5.1.6.1.1 No Action Alternative

Under the no action alternative, there would be no direct impacts on sensitive vegetation communities. However, indirect impacts would occur because non-native and invasive species would remain in the proposed and connected project areas and continue to compete with native vegetation communities. Sensitive vegetation communities, such as northern maritime chaparral are particularly vulnerable to stressors, such as competition with invasive species. Under the no action alternative, invasive species would continue to pose a threat to this sensitive vegetation community.

5.1.6.1.2 Proposed and Connected Actions

Implementation of the proposed and connected actions could result in adverse impacts on sensitive vegetation communities from physical destruction or trampling by heavy equipment. In addition, long-term adverse impacts could occur if areas disturbed during implementation of the proposed and connected actions are not restored and maintained.

Northern maritime chaparral occurs within the Sobrante Ridge and Huckleberry Botanic Regional Preserves and is dominated by brittle-leaf and pallid manzanita with scattered oak trees.

During implementation of the proposed and connected actions, hand labor would be used in areas of pallid manzanita to limit ground disturbance and prevent mature oak canopy from being affected.

Serpentine bunchgrass within the Skyline Serpentine Prairie in Redwood Regional Park is protected and managed by the EBRPD (EBRPD 2009e). No treatment or other activities would occur in this protected area, and there would be no impacts.

Small remnants of coastal terrace prairie are dispersed within the California annual grassland in the portion of the proposed and connected project areas at the Miller/Knox Regional Shoreline. Vegetation management goals under the proposed and connected actions are to retain grassland communities; therefore, potential impacts on the remnant coastal terrace prairie community would not be significant.

While complete avoidance of sensitive vegetation communities would not be possible, short-term and temporary impacts would not be significant with the use of hand labor to reduce disturbance that would result from heavy equipment. In addition, MMPs, as described in Section 5.1.2.2.1, would be implemented to avoid or reduce potential long-term impacts on sensitive vegetation communities such that impacts would not be significant. Vegetation management goals associated with the proposed and connected actions would entail the eradication and control of non-native and/or invasive vegetation such that native vegetation communities would experience long-term beneficial effects.

5.1.6.1.3 Mitigation Measures

MMPs would be implemented, as described in Section 5.1.2.2.1, to avoid impacts to sensitive vegetation communities. Mitigation measures to reduce impacts on sensitive riparian and wetland habitats associated with aquatic features are presented in Section 5.1.3.3.

5.1.6.2 Special-Status Wildlife Species and Critical Habitat

This section describes potential impacts on special-status wildlife species and critical habitat under the proposed and connected actions and the no action alternative. Special-status species include federal- and/or state-listed as threatened, endangered, and/or candidate species by USFWS and/or National Marine Fisheries Service (NMFS) as well as those identified as species of concern by CDFW. Special-status invertebrate, amphibian, reptile, bird, and mammal species that have the potential to occur in the proposed and connected project areas are listed in Table 4.2-3.

Federally listed wildlife species are evaluated in more detail in the BA that has been submitted by FEMA to USFWS and NMFS. USFWS and NMFS will issue a Biological Opinion (BO) in response to the BA. The BO would be part of the final EIS.

5.1.6.2.1 No Action Alternative

Under the no action alternative, there would be no direct impacts on special-status wildlife species. However, the presence of non-native and invasive plants would continue and could have long-term indirect impacts on habitat for special-status wildlife due to loss of suitable habitat. In

addition, there would continue to be a threat of wildfire, which could impact special-status wildlife species and their habitats.

5.1.6.2.2 Proposed and Connected Actions

Impacts during Implementation

Special-status wildlife species, including CRLF, AWS, and other species that have the potential to occur in the proposed and connection project areas (see Table 4.2-3 in Section 4.2), could be directly impacted if they are present in treatment, staging, or access areas during implementation. Manual vegetation treatment methods could result in temporary harm and/or harassment effects, whereas the use of heavy machinery for vegetation treatment would have the potential to injure or kill wildlife that may enter or be present in heavy equipment use areas. Mitigation measures would be required to avoid or reduce these potential impacts such that they would not be significant. These mitigation measures, presented in Section 5.1.6.2.3, would include employing a biological monitor, timing the work to occur during specific times of year when the species themselves or their vulnerable life stages are not present, and additional species-specific measures for CRLF and AWS (Section 5.1.6.2.3).

Impacts from Habitat Loss or Alteration

Temporary loss of habitat for special-status wildlife could occur from clearing and grading of vegetation, removal or disturbance of breeding sites, collapsing of burrows and other sheltering areas, or sedimentation in aquatic habitats from overland flow of rainwater over disturbed soil areas. Standard best management practices would be implemented to avoid sedimentation impacts. However, impacts on habitat for special-status species due to vegetation removal or alteration of breeding or sheltering areas could occur and would be short-term and temporary. Long-term impacts due to habitat alteration would be reduced with the implementation of mitigation and monitoring plans, which include requirements for achieving a minimum percent cover of plant species to support native vegetation communities and habitats.

Impacts From Herbicide Application

The application of herbicides could potentially result in impacts related to toxicity for wildlife due to direct contact with chemicals themselves or to exposure from chemicals that bioaccumulate in prey. An analysis of the toxicity of the proposed herbicides (e.g., Garlon 4 Ultra, Stalker, and Roundup), indicates that direct contact and dietary-related adverse effects are not anticipated with appropriate and careful application (see Appendix L). The mitigation measures described in Section 5.1.3.3.2 would be implemented to reduce potential impacts related to herbicide application. In addition, specific recommendations for herbicide application to avoid toxicity effects to the AWS and CRLF are included in the mitigation measures described in Section 5.1.6.2.3.

In Appendix F, ecological risks to the AWS, CRLF and the central California coast (CCC) steelhead were assessed. The following summarizes the potential ecological risk from herbicides to each of these species.

AWS: The two potentially most important routes of exposure of the AWS to herbicides are direct (dermal) contact and dietary. Significant dietary exposures are unlikely given the low bioaccumulation potential of the proposed herbicides. Direct contact with herbicides is not expected to result in adverse effects in the whipsnake given its relatively impermeable skin and the low likelihood of contact. The expectation of limited direct contact with herbicides is based on the assumption that herbicides would be applied directly to stumps of non-native trees, most frequently eucalyptus, which is not desirable habitat for the AWS. Herbicide application is expected to be most intense in areas where these trees are most abundant, and are, therefore, not areas preferred by the whipsnake. Because of habitat unsuitability, AWS are unlikely to frequent areas where herbicide application is expected to be most aggressive.

CRLF: As with the AWS, the primary routes of exposure to herbicides for terrestrial life stages of amphibians, such as the CRLF, are dermal contact and dietary. For eggs and larval stages (tadpoles), the primary exposure route of concern is direct contact with surface water (eggs and tadpoles) and ingestion of surface water (tadpoles). Exposure potential for adult amphibians due to their more permeable skin is expected to be greater than that predicted for terrestrial reptiles whose skin provides some level of protection. Adult CRLF are, however, unlikely to frequent the terrestrial environments during the dry season when herbicide application is expected to occur. Therefore, the potential for direct contact exposure to herbicides for adult individuals is low.

Dietary exposure via consumption of prey and other food items would be important for amphibians at all life stages if the herbicides proposed for use were bioaccumulative. Accumulation of herbicides in algae and detritus (the primary dietary items for larvae) and in prey items of adult frogs (e.g., insects, other invertebrates, occasionally small vertebrates) is expected to be minimal, however. This conclusion is based on the expectation that adult frogs would remain near water in the dry season, when herbicide application is most likely to occur, and the recommendation that application of herbicides near surface water bodies would be to stumps only, with mitigation measures described in Section 5.1.3.3.2 to reduce the potential for runoff or drift, so transport of terrestrial-applied herbicides to water bodies should be minimal. Support for the assumption of low bioaccumulation potential is provided in Appendix F and Appendix L. Recommendations for protection of the CRLF (see Section 5.1.6.2.3 and Table 1 of Appendix F) should be strictly followed to limit ecological risk to all life stages of amphibians in and downstream from the proposed and connected project areas.

CCC Steelhead Distinct Population Segment: The primary route of exposure to sprayed herbicides for steelhead and other fish is direct contact with and ingestion of potentially contaminated surface water from Wildcat Creek. From the studies reviewed for salmonids or freshwater fish more generally, and based on the chemical characteristics of the three herbicides of interest, bioaccumulation potential is expected to be low and likely insignificant (See Appendix F and Appendix L).

Garlon® 4 is generally the most toxic of the three herbicides to fish. Implementation of the Herbicide Application Mitigation Measures (BR-1) described in Section 5.1.3.3.2 would prevent transport of herbicides to surface water bodies via runoff or drift and thereby avoid the potential for adverse impacts. Even if some runoff or drift inadvertently reaches Wildcat Creek, it would be likely to be quickly diluted and mixed in the flow of the creeks.

Researchers have calculated that if Garlon®4 was applied at the highest reasonable application rate directly to water, water concentrations likely would remain below 1 milligram per liter (mg/L) (1 part per million). Based on the studies reviewed, this likely maximum concentration in surface water (1 mg/L) should be protective of both adult and juvenile CCC steelhead and other potentially sensitive freshwater fish (See Appendix F and Appendix L for more information).

Impacts on Critical Habitat

Designated critical habitat for AWS occurs within the proposed and connected project areas (critical habitat Unit 1 [Tilden-Briones], critical habitat Unit 2 [Oakland-Las Trampas], and critical habitat Unit 6 [Caldecott Tunnel Corridor]). Based on the analysis of the primary constituent elements (PCEs) for critical AWS habitat performed for the BA, the proposed and connected actions would retain or increase the existing acreages of PCEs although the relative amounts of PCE 1 (core scrub habitat) and PCE 2 (foraging/dispersal habitat) may vary. For the EBRPD project areas, the spatial configuration of PCE 1 would be modified through thinning and removal of core scrub to establish scrub islands. Areas where core scrub would be thinned to create scrub islands would result in short-term adverse effects to designated critical AWS habitat. However, these areas would still meet the definition of scrub shrub habitat as the patches would be retained in close proximity to each other. For UCB and the City of Oakland parcels, an increase in spatial extent of existing PCEs would be expected as a result of invasive plant species removal within designated critical AWS habitat. Nonetheless, impacts on critical AWS habitat would be significant because the functionality of the PCEs provided by the critical habitat in the project areas would be reduced. USFWS will issue a BO in response to the BA to issue an Incidental Take Permit and additional offsetting measures to minimize the adverse impact to AWS critical habitat. Based on the ongoing coordination with USFWS during preparation of the BA, the adverse effects to AWS and its critical habitat would not jeopardize the continued existence of the species.

No designated critical habitat for CRLF, CCC steelhead, or any other special-status species is within the proposed and connected project areas; therefore, there would be no impact.

5.1.6.2.3 Mitigation Measures

This section provides the proposed mitigation measures that would be implemented to reduce potential impacts on special-status wildlife species under the proposed and connected actions such that they would not be significant.

Biological Monitor (BR-3)

As part of the effort to avoid and minimize potential effects to special-status species and their habitats, a biological monitor would be made available to be on site and/or on-call during implementation activities. The following measures would be implemented with respect to the biological monitor:

- At least 20 working days prior to the date the project is initiated in the field, the subapplicant would submit the names and credentials of the onsite project biological monitors to USFWS and/or NMFS for review and approval. The biological monitors

would have demonstrated knowledge of the biology and ecology of the AWS and CRLF and field experience identifying these species as well as botanical knowledge in regards to the federally listed plants. No project activities would begin until the subapplicant or project proponents have received written approval from USFWS and/or NMFS that the biological monitor(s) are qualified to conduct the work. Information included in a request for authorization as a USFWS and/or NMFS-approved biological monitor should include, at a minimum: (1) relevant education; (2) relevant training on species identification, survey techniques, handling individuals of different age classes, and handling of different life stages by a permitted biologist or recognized species expert authorized for such activities by USFWS and/or NMFS; (3) a summary of field experience conducting requested activities (to include project/research information); (4) a summary of BOs under which they were authorized to work with the listed species and at what level (such as construction monitoring versus handling), including the names and qualifications of persons under which the work was supervised as well as the amount of work experience on the actual project; (5) A list of federal recovery permits [10(a)1(A)] held or under which are authorized to work with the species (to include permit #, authorized activities, and name of permit holder); and (6) any relevant professional references with contact information. USFWS and/or NMFS would provide written approval within 10 business days of receipt of the provided information.

- A USFWS and/or NMFS-approved biological monitor would be on site during implementation of project activities that may result in take of federally listed species. Additionally, the biological monitor would be given the authority through communication with the project manager or the project manager's designee to stop any work that may result in take of the CRLF, AWS, and/or other listed species. If the USFWS and/or NMFS approved biological monitor exercises this authority, USFWS and/or NMFS would be notified by telephone and electronic mail within 1 working day. The USFWS contact is Coast Bay/Forest Foothills Division Chief, Endangered Species Program, at the Sacramento Fish and Wildlife Office at telephone (916) 414-6600. The NMFS contact is the Protected Resources Division Chief, North Central Coast Office/ Santa Rosa National Marine Fisheries Service at telephone (707) 575-6050.
- The USFWS and/or NMFS-approved biological monitor(s) would be on site to monitor the initial vegetation removal and/or ground disturbance activities. The USFWS and/or NMFS-approved biological monitor(s) would perform a clearance survey for listed species immediately prior to the initial ground disturbance.
- An employee education program on the federally listed species would be completed prior to the date of initial groundbreaking or vegetation clearing (whichever date comes first) at the project. The program would consist of a brief presentation by the USFWS and/or NMFS-approved biological monitor(s) to explain endangered species issues to all contractors, their employees, and agency personnel involved in the implementation of the project. The program would include a description of the federally listed species and their habitat needs, an explanation of the status of these species and their protection under the ESA, associated consequences of non-compliance with this opinion, and a description of the measures being taken to reduce effects to these species during project implementation.

- Based on training from the biological monitor, all contractors, their employees, and agency personnel involved in the implementation of the project would check for the presence of snakes or frogs next to stationary vehicles, prior to operating the vehicles. If found, the biological monitor would be contacted prior to operating the vehicle. The biological monitor would contact USFWS immediately if an injured snake or frog is found to determine necessary steps.
- If the USFWS and/or NMFS-approved biological monitor(s) observed either of the two listed species in the work area, they would stop work and move the CRLF to a safe location within walking distance of the location where it was found; or if possible, AWS or CRLF would be allowed to disperse on its own. The individual animal would be monitored by the USFWS and/or NMFS-approved biological monitor until it has been determined that it is not imperiled by predators or other dangers. Neither of these two listed species would be moved to laboratories, holding facilities, or other facilities without the written authorization of the USFWS and/or NMFS.
- The USFWS and/or NMFS-approved biological monitor(s) may use nets or their bare hands to capture CRLF at the project site. The USFWS and/or NMFS-approved biological monitors(s) would not use soaps, oils, creams, lotions, repellents, or solvents of any sort on their hands within 2 hours before and during periods when they are capturing and relocating either of these two listed species. The USFWS and/or NMFS-approved biological monitors(s) would limit the duration of handling and captivity of individuals of the listed amphibian. The USFWS and/or NMFS-approved biological monitor would minimize the potential for infecting CRLF with amphibian diseases when capturing and relocating these species by implementing the measures in *The Declining Amphibian Task Force Fieldwork Code of Practice* (available at the Ventura Fish and Wildlife Office's website at http:// www.fws.gov/ventura/species_information/protocols_guidelines/docs/DAFTA.pdf). While in captivity, individuals of the CRLF would be kept in a cool, moist, aerated environment, such as a bucket containing a damp sponge. Containers used for holding or transporting adults of the amphibian would not contain any standing water. The AWS would be placed in a pillowcase or similar container for transport to the release site.
- If the USFWS and/or NMFS-approved biological monitor exercises stop work authority, USFWS and/or NMFS would be notified by telephone and electronic mail within 1 working day. The USFWS and/or NMFS-approved monitor would be the contact for any employee or contractor who might inadvertently kill or injure a CRLF and/or an AWS or anyone who finds a dead, injured, or entrapped individual of these two listed species. The USFWS and/or NMFS-approved biological monitor would possess a working cellular telephone whose number would be provided to the USFWS and/or NMFS.
- Sensitive habitat areas, including AWS and CRLF habitat, known populations of pallid manzanita, and wetlands on the project plans, would be clearly indicated. These plans would be submitted to USFWS and/or NMFS for review prior to project implementation.
- Following approval of plans identifying sensitive habitat by USFWS and/or NMFS, sensitive areas would be delineated with high visibility, temporary, orange-colored fence at least 4 feet in height, flagging, or other barriers. These areas would be avoided to the maximum extent practicable.

- During work activities, ground burrows, holes, and tunnels that provide shelter for small animals would be avoided to the maximum extent practicable.

Species-Specific Work Windows and Additional Measures (BR-4)

In coordination with USFWS and NMFS, work windows have been developed during which the treatment activities would be implemented to avoid effects to federally listed species. Minor vegetation removal activities that are unlikely to injure CRLF or AWS could be implemented during the course of the year with proper BMPs in place. Major ground disturbing activities and use of heavy machinery would require consideration of appropriate work windows for each species, resulting in an open work window to occur between August 1 and November 30. This time frame would also address the work windows for avoiding nesting migratory birds (February through July), hibernating AWS (November 1 to March 31), and the wet season for the CRLF (October 15 to May 15). Although November 1 is typically the start of the wet season, the potential for injuring dispersing CRLF would be minimized by installing exclusion fencing prior to the start of the wet season and avoiding work in dispersal habitat on days with 40% or greater chance for rainfall. Additionally, because AWS begin hibernating in November, any activities that may crush burrows would be avoided by not allowing the use of heavy equipment from November 1 through March 31. Additional considerations for species and work windows are provided in the paragraphs below.

Additional Measures Specific to CRLF (BR-5)

- To the extent practicable, treatment activities involving heavy equipment and/or significant ground disturbance would not occur between April 15 and August 1 within any areas determined to be suitable CRLF breeding habitat (aquatic habitat plus a 60-foot linear buffer) or where the species is deemed present by the biological monitor to avoid potential disturbance to breeding CRLF.
- In areas where herbicides would be applied within 60 feet of the ordinary high water mark of areas determined to be suitable CRLF breeding habitat, only aquatic-safe formulations of herbicides (e.g. Garlon 3A) would be used, and they would be applied only by brushing directly onto stumps. Herbicide use in these areas would be limited to August 1 to October 31 to avoid potential impacts to CRLF tadpoles, egg masses, and dispersing adults. No foliar application of herbicides would occur within 60 feet of breeding habitat for the CRLF or in any areas subject to potential drift to breeding habitat for the CRLF. Species-specific BMPs for the protection of CRLF and associated habitats are also discussed in Appendix F and Appendix L, and these are based on application restrictions imposed by the injunction issued on October 20, 2006 by the U.S. District Court for the Northern District of California.
- In areas with potential or known occurrences of CRLF, exclusion fencing would be installed (prior to the start of the wet season) to prevent frogs from entering an active vegetation treatment area. The exclusion fencing would consist of geotextile fabric with one-way exit funnels every 100 feet. The geotextile fabric would be ERTEC-E or equivalent as approved by the USFWS prior to installation. The lower portion of the fence would be buried to a depth of 4 to 6 inches, and the top of the fence would extend at least 36 inches above ground level. Shrubs within approximately 3 feet of the outside

of the fence would be trimmed to prevent access via the shrubs over the fence. The fence would be secured to metal posts and/or wooden stakes to ensure it remains upright and does not fall over. Posts/stakes would be placed on the inner side of the fence to ensure AWS do not enter the work site by climbing the posts/stakes. A USFWS-approved biological monitor would be on site during installation of the fencing to relocate any listed species to outside the treatment area. The biological monitor would survey the work area daily to ensure the fencing is secure and that no listed species are trapped inside. The fencing would be continuously maintained until all construction activities are completed. Following project implementation, fencing would be removed.

Additional Measures Specific to AWS (BR-6)

- To the extent practicable, treatment activities involving heavy equipment and or significant ground disturbance within any areas determined to be suitable AWS habitat would not occur between November 1 and March 31 to avoid potential disturbance to hibernating snakes. Treatments involving hand crews, light mechanical equipment, or prescribed burning can be implemented during the course of the year with proper BMPs in place.
- Exclusion fencing would be installed around all areas where heavy equipment is operated, including landing areas, access roads, and staging areas. Following project implementation, fencing would be removed. See BR-5 above for details on exclusion fencing.
- Skid trails would be sited a minimum of 10 feet away from core AWS habitat and rock outcrops.
- Rock outcroppings and native shrubs within 50 feet of rock outcrops would be maintained and protected from vehicles using orange construction fencing.
- Wood chips and landings would not be placed within 50 feet of rock outcrops.

Avoidance Measures to be Implemented During Pile Burning (BR-7)

The following is a draft list of avoidance measures for pile burning that would be implemented when burning piles at all sites with potential AWS habitat that are not isolated and are connected to known sites or quality sites with rock outcroppings:

- Check for burrows before building pile. Avoid placing piles on rodent burrows.
- Light pile from one end (generally the uphill side on slopes) to allow snakes to escape, rather than lighting the whole pile at once.
- Limit material in pile to 4 inches in diameter or less to limit heat penetration into the ground and provide short escape distance.
- Pile burning would not occur in suitable AWS habitat during the hibernation season (e.g. November 1 to March 31).
- No heavy equipment that could collapse burrows within suitable habitat for AWS during the hibernation period (November 1 – March 31).

5.1.6.3 Special-Status Plant Species and Critical Habitat

This section describes potential impacts on special-status plant species and critical habitat under the proposed and connected actions and the no action alternative. Special-status plants include those federal- and/or state-listed as threatened, endangered, and/or candidate species by USFWS and as rare, threatened, or endangered by the CNPS. Special-status plant species that have the potential to occur in the proposed and connected project areas are listed in Table 4.2-3. Federally listed plants are evaluated in more detail in the BA.

5.1.6.3.1 No Action Alternative

Under the no action alternative, there would be no direct impacts on special-status plants. However, the presence of non-native and invasive plants would continue and could have long-term indirect impacts through competition with special-status plants. In addition, there would continue to be a wildfire hazard from the presence of fire fuel, which could impact special-status plants.

5.1.6.3.2 Proposed and Connected Actions

Impacts during Implementation

Special-status plant species, including pallid manzanita, Presidio clarkia, and other special-status plants that have the potential to occur in the proposed and connected project area (see Table 4.2-3), could be directly impacted if they are present in treatment, staging, or access areas during implementation. Plants could be damaged or killed by workers or heavy machinery or indirectly impacted from loss of suitable habitat conditions. Mitigation measures described in Section 5.1.6.3.3 would be required to avoid or reduce these potential impacts such that impacts would not be significant.

Impacts from Habitat Loss or Alteration

Temporary loss or alteration of habitat could result in impacts on special-status plants due to erosion or changes in soils from the placement of eucalyptus wood chips. During implementation of the proposed and connected actions, the best management practices described in Section 5.1.3.3.1 would be implemented to avoid potential impacts from soil erosion. In addition, MMPs would be implemented to restore and enhance native habitats in the long-term. An analysis of the potential for toxicity from eucalyptus wood chips indicates that short-term and localized effects on soil microbes, soil invertebrates, and terrestrial plant seedlings may result from exposure to fresh eucalyptus and possibly pine wood chips (see Appendix L). However, once aged for a few months, these chips are expected to be nonhazardous to soil associated organisms; therefore, impacts to plants from the use of wood chips would be less than significant.

Impacts From Herbicide Application

The application of herbicides could result in impacts on special-status plants if there is direct contact with chemicals that cause toxicity. Herbicide application is unlikely to affect pallid manzanita or Presidio clarkia because these species are not known to be present in the treatment areas proposed for herbicide application. However, if pallid manzanita, Presidio clarkia, or other special-status plants are present, they could be affected. Mitigation measures described in

Section 5.1.6.3.3 would be taken to protect any special-status plants that could be present unexpectedly in or near the treatment areas. These measures include surveys for special-status plants prior to vegetation treatment. If special-status plants are identified, they would be flagged and avoided. Additional measures specific to pallid Manzanita would be implemented (see BR-9), including the requirement that herbicide use within 300 feet of pallid manzanitas would be applied through direct application to the stump only. With the implementation of these mitigation measures, impacts to special-status plants from herbicide application would be less than significant.

In Appendix F, ecological risks to the pallid manzanita and the Presidio clarkia were assessed. The following summarizes the potential ecological risk to each of these species.

Pallid manzanita and Presidio clarkia: The primary routes of exposure to herbicides for woody and broadleaf terrestrial plants, including manzanita and flowers, such as the Presidio clarkia, are direct exposure to the leaves either from intentional application near these species or drift from locations targeted for spraying. Drift would be minimized since herbicide application is proposed to be focused on direct application to cut stumps, and foliar application is proposed to be limited to maintenance activities. Further, BMPs are in place to prevent application during rain events or during windy days when drift would be more likely. Recommendations for the protection of the pallid manzanita and Presidio clarkia (see Section 5.1.6.3.3 and Table 1 of Appendix F) should be strictly adhered to in order to limit ecological risk to these and other special status plants in the project area.

Impacts to Pallid Manzanita From Phytophthora cinnamomi

Potential introduction and spread of the fungal pathogen *Phytophthora cinnamomi* into existing stands of pallid manzanita would be prevented by implementing measures specific to preventing the spread of plant pathogens (*e.g.*, equipment and vehicle washings before and after vegetation management within areas of known pallid manzanita) as described in Section 5.1.6.3.3.

Impacts on Critical Habitat

No critical habitat has been designated for pallid manzanita or Presidio clarkia, and there is no designated critical habitat for any other special-status plant species in the proposed and connected project areas. Therefore, there would be no impact.

5.1.6.3.3 Mitigation Measures

Protocol Surveys (BR-8)

As described in Section 5.1.6.2.3, a biological monitor would be made available to be on site and/or on call during implementation activities to avoid or reduce potential impacts on special-status species under the proposed and connected actions such that impacts would not be significant. In addition, the following measure specific to special-status plants would be implemented:

- Pre-implementation surveys would be conducted to determine the presence of special-status plants within the project areas where vegetation management activities would be

conducted. Botanists would conduct a botanical survey for the listed species during the blooming period for each species before vegetation management activities start. All special-status plants would be clearly flagged with high visibility flagging and avoided.

Additional Measures Specific to Pallid Manzanita (BR-9)

1. Prior to conducting activities within recommended treatment areas (RTAs) that support *Arctostaphylos* spp., a service-approved biologist familiar with identifying *Arctostaphylos* spp. and their hybrids would train all project staff regarding habitat sensitivity, identification of pallid manzanitas and their hybrids, and these minimization, avoidance, and compensation measures.
2. No *Arctostaphylos* spp., within any project area, would be removed without verification from the service-approved biologist that the *Arctostaphylos* spp. in question is not a pallid manzanita.
3. No living pallid manzanitas, as determined by the service-approved biologist and the presence of any photosynthesizing leaves, would be removed or damaged.
4. No pallid manzanita branches supporting photosynthesizing leaves would be cut, removed, or damaged.
5. All shrubs and trees that are not a component of the maritime chaparral vegetation type within 20 feet of pallid manzanita plants and all shrubs or trees that are excessively shading pallid manzanita plants (i.e., pines, acacias, eucalyptus, oak, bay, madrone, etc.) would be cut and treated to reduce competition with pallid manzanitas and to reduce fuel loads.
6. Prior to any fuel reduction activities within pallid manzanita stands, the stand would be surveyed for mature and seedling (less than 5 years of age) pallid manzanitas except within 25 feet of where *P. cinnamomi* has been identified. All adults and seedlings would be flagged with high visibility flagging and avoided.
7. Herbicide use within 300 feet of pallid manzanitas would be applied through direct application to the stump only.
8. Goat grazing is prohibited within treatment areas containing pallid manzanitas.
9. Prior to implementing any activity within any RTA containing pallid manzanitas, a service-approved adaptive management plan would be created for all stands of pallid manzanitas within the RTAs. The plan would be designed to ensure the long-term persistence of the pallid manzanita stands and to guide future management actions in and around this species, including monitoring and limiting the spread of *P. cinnamomi* within and between stands.
10. No pile burning would be conducted within areas containing pallid manzanita.

To reduce the spread of *P. cinnamomi* within the RTAs containing pallid manzanita plants, the following minimization and avoidance measures would be implemented:

1. Each year or prior to any wildfire hazard reduction activities within a watershed supporting pallid manzanitas, an appropriately timed survey of the site to be treated would be conducted by a qualified person approved by the service to identify areas infected with *P. cinnamomi*.
2. Work within 100 feet of any area known to be infected with *P. cinnnamomi* would be scheduled to occur after all other areas within 500 feet of the infection have been treated.

3. A specific ingress/egress route that minimizes the potential spread of *P. cinnamomi* would be identified by a service-approved biologist when working within watersheds that support pallid manzanitas.
4. A wash station would be established at the ingress/egress location. Prior to entering or exiting the ingress/egress location, any potentially contaminated material would be removed from all boots, hand tools, clothing, and other equipment, then these items would be disinfected using 70% isopropanol (rubbing alcohol) or another service-approved substance known to disinfect *P. cinnamomi* contaminated equipment.
5. All work within 300 feet or upslope of pallid manzanitas would be conducted using hand-tools only.
6. Vehicles are prohibited off of service roads within 200 feet of pallid manzanitas.
7. No treatment activities except for pile burning would be conducted during the wet season (October 15 to May 15) within RTAs containing pallid manzanitas.
8. Pile burning would not occur within 100 feet of any area infected with *P. cinnamomi* during the wet season (October 15 to May 15).
9. Within watersheds that support pallid manzanitas, the transportation of wood, slash, and other debris would only be conducted under the guidance of a service-approved biologist and in a manner that minimizes the potential spread of *P. cinnamomi*.
10. Prior to conducting any activities within watersheds that support pallid manzanitas, all personnel would attend an environmental awareness training session designed to inform workers about the long-term effects of *P. cinnamomi*, how it is spread, and these minimization and avoidance measures.

Additional Measures Specific to Presidio clarkia (BR-10)

EBRPD has mapped the known occurrence area for Presidio clarkia within Redwood Regional Park. There would be no vegetation management or treatment, including no mowing or grazing, within the Presidio clarkia occurrence area. Therefore, no impacts on known populations of Presidio clarkia are anticipated.

There is approximately 0.08 acres of serpentine bunchgrass community that is considered potential habitat within the same parcel as the known occurrences of Presidio clarkia in Redwood Regional Park. There are no known Presidio clarkia plants in this area. If vegetation management activities are to be conducted within this area, surveys for Presidio clarkia or other special-status plants would be conducted prior to implementation. If Presidio clarkia or other special-status plants are found, EBRPD would consult with USFWS prior to implementation of any vegetation management activities to determine the appropriate BMPs to be implemented to avoid impacts.

5.2 Fire and Fuels

This section assesses the effectiveness of the proposed and connected actions and the no action alternative in reducing the risk from fire hazards.

5.2.1 General Observations

All of the vegetation management methods included in the proposed and connected actions would reduce the fuel load in the project areas. The modeling performed using FlamMap indicated that the proposed and connected actions would greatly reduce flame lengths, production of flaming embers, and the impact of wildfires on structures.

The vegetation management measures included in the proposed and connected actions would reduce fuel volume and would reduce the fire behavior of the remaining fuel. The proposed and connected actions would selectively remove dead material, which burns more intensely than living material. Live material in shrubs and brush is not likely to produce as dangerous a wildfire in the absence of dead material, especially if the overall fuel volume is low.

The proposed and connected actions would remove the lower limbs of trees, which would reduce the likelihood that surface fires would move up the trees to become crown fires. Trees that burn intensely and generate greater numbers of flaming embers that can start new fires and ignite structures, such as eucalyptus[1] and Monterey pine[2], would be thinned or removed entirely.

The proposed and connected actions would generate wood chips that would be spread over approximately 20% of many project areas to a maximum depth of 2 feet. The wood chips would not be the relatively stringy shreds created by many wood shredders or masticators. Rather, they would be compact and would create compact beds. The natural compaction of the chips would reduce the probability of ignition and spread of a fire (Oakland Fire Department Nd.). Burning chips typically smolder with low flame length (Oakland Fire Department Nd). On the other hand, wood chip fires can be difficult to put out, and spontaneous combustion can occur in layers more than a foot deep (Oakland Fire Department Nd.). If a fire occurs in wood chips, it may be necessary to dig up the chips to put out the fire.

An 8-foot flame length represents a nationally recognized standard above which erratic fire behavior and difficulty in control and suppression are anticipated. The reduced flame lengths predicted after implementation of the proposed and connected actions indicate that fire suppression efforts are likely to be much more effective. As a guide to estimating threat, the structure analysis uses the interpretations of the relationship between flame length and firefighting tactics shown in Table 5.2-1.

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[1] http://www.fs.fed.us/database/feis/plants/tree/eucglo/all.html, Fire Ecology

[2] http://tornado.sfsu.edu/geosciences/classes/m356/OaklandHillsFire/www.firewise.org/pubs/theOaklandBerkeleyHillsFire/ vegetation.html

Table 5.2-1. Fire Suppression Interpretations of Flame Length and Fire Intensity[1]

Flame Length	Interpretations
Up to 4 feet	Fires can generally be attacked at the head or flanks by firefighters using hand tools. Hand line should hold fire.
4 to 8 feet	Fires are too intense for direct attack on the head with hand tools. Hand line cannot be relied on to hold the fire. Dozers, tractor plows, engines and retardant drops can be effective.
8 to 11 feet	Fire may present serious control problems: crowning, torching, and spotting. Control efforts at the head of the fire would likely be ineffective.
More than 11 feet	Crowning, spotting, and major fire runs are probable. Control efforts at the head of the fire are ineffective.

[1]Rothermel 1983.

The proposed and connected actions would reduce torching and crown fire, in which the canopy of groups of trees catches fire. Reduction of torching is a significant benefit because the burning embers cast off as a result of torching are a major cause of structure loss (Foote, Liu, and Manzello 2011). Embers can become lodged in crevices in a building or deck and can cause the structure to ignite. Embers tend to be borne by heat currents and wind ahead of the flaming front and can advance the fire more quickly and complicate suppression efforts by causing multiple simultaneous ignitions.

For the effects of the proposed and connected actions to be long-lasting, maintenance and follow-up treatments would be required, as described in Section 3.4.2.

Several different metrics were used to analyze the efficacy of the proposed and connected actions and the no action alternative. Fire behavior is complex and not easily modeled. It is necessary to look at all the results and not any one component to make an informed decision on the best approach to fire hazard reduction. Also, professional judgment and experience are necessary to interpret modeling results. For a more detailed explanation of the methodology used, refer to Section 4.3.

The modeling was limited to the proposed and connected project areas. The model does not account for the influence of a fire from outside the project areas, which would have a cumulative effect on the area as a whole. The proposed and connected actions would not eliminate the potential for destructive wildfire across the entire landscape. The more fuel reduction treatments are done adjacent to each other, the more effective they would be in creating a fuel break and in significantly reducing wildfire hazard and risk.

The results of the fire behavior analysis are summarized below. The discussion focuses on the effects of fuel treatments on the entire area, looking at the average of each of the metrics used. Some project areas are discussed in the text, and the results for all project areas are shown in the tables.

5.2.2 No Action Alternative

Under existing conditions, without any significant fuel reduction, it is predicted that 35% of the proposed and connected project areas would have high or extreme fire behavior, with average flame lengths of approximately 11 feet (see Figures 5.2-1 and Table 5.2-2). This type of fire

behavior cannot be fought directly by firefighters. Aircraft and indirect attack methods must be used because control efforts are ineffective at the head of the fire (see Table 5.2-1). Torching and crown fire are common in areas with tree canopies. Of the 105 project areas, 33 have predicted average flame lengths over 11 feet. Some of the highest flame lengths were in the proposed Claremont-PDM project area (70 feet) and proposed project area TI016 (106 feet).

Structures can be impacted by their proximity to high flame lengths. By this measure, 232 structures are predicted to be within 200 feet of flame lengths greater than 8 feet (see Figure 5.2-2). The highest number of threatened homes near an individual project area is 66 within 200 feet of 8-foot flame lengths in proposed project area WC011. The next highest is proposed project area HP002 with 23 structures (see Figure 5.2-2 and Table 5.2-3).

Another metric used is crown fire potential. Group torching and crown fire make suppression more difficult and are an indicator of extreme fire behavior (see Figure 5.2-3 and Table 5.2-4). Under current conditions, group torching or crown fire is expected in 58% of the project areas. Most of this would occur in the eucalyptus and pine stands but also in areas that have a high shrub component.

As trees torch and their tops burn they generate embers that move ahead of the main fire front and propagate new fires. Embers are the main cause of structure losses. The model does not specifically determine if the embers would start another fire, which is referred to as probability of ignition. The probability of ignition in vegetated areas is determined largely by temperature, the moisture content of the fine dead surface fuel, and relative humidity. Under hot, dry, windy conditions, 50% of the embers could grow into new fires. Dense shrubs are also capable of creating embers and can burn very hot, generating radiant and convective heat that can affect downwind structures.

Crown fire was used as a proxy to decide if ember cast would occur. Ember cast or spotting is a significant problem, especially in eucalyptus stands. Under the no action alternative, an estimated 4,590 homes would be impacted by ember cast. The model restricted spotting distance to 2,000 feet, so the number of affected homes could be higher. When crown fire occurs in eucalyptus, it is not uncommon to have spotting distances of half a mile or more. The highest number of homes threatened by ember cast from an individual project area is 644 for proposed project area WC011. The next highest is proposed project area RD002 with 558 structures. The modeling indicated that 18 project areas threaten at least 100 structures through ember casting under current conditions (see Figure 5.2-4 and Table 5.2-5).

5.2.3 Proposed and Connected Actions

The proposed and connected actions would focus on total removal or a significant reduction of overstory (relatively tall) non-native trees in many areas. Shrublands would be converted to grasslands or a mosaic mixture of shrubs and grass in many EBRPD projects but would not be treated extensively in UCB and City of Oakland projects. When maintained as planned, these overstory treatments would greatly reduce flame length and intensity. Where the tree canopy would be eliminated, the chance of torching and crowning would be eliminated. Where the tree canopy would be thinned, the potential for crown fires would be reduced. Many remaining trees would be pruned up to 8 feet from the ground, reducing the chance of fire moving up into the

tops of the trees and causing torching. As a result, the potential for producing embers would also be greatly reduced. Where shrubs are not treated, there is still potential for moderate to high fire behavior. Ember cast is also likely, but it would travel less distance than from the tree canopies.

The calculated average flame length under the proposed and connected actions is approximately 2 feet, with 89% of the areas in the low or moderate fire behavior categories (see Figure 5.2-1 and Table 5.2-2). This type of fire behavior can be extinguished readily by direct attack (see Table 5.2-1). Proposed Caldecott Tunnel-PDM still has predicted flame lengths of 23 feet. This is attributable to the understory shrubs in the oak-bay woodlands that would not be treated.

Under this alternative, the model predicts that 16 structures would be within 200 feet of flame lengths greater than 8 feet. This is a 93% reduction from the no action alternative. All but seven project areas would be reduced to zero structures threatened. Of the seven project areas that would still threaten structures, all but one would threaten fewer homes than under the no action alternative (see Figure 5.2-2 and Table 5.2-3).

The model indicates that the proposed and connected actions would reduce crown fire potential to 10% of the project areas (see Figure 5.2-3 and Table 5.2-4). This is primarily due to cutting of overstory trees. Three project areas would not have any reduction in crown fire (proposed Caldecott Tunnel-PDM, proposed HP002, and proposed TI006), and eight would have a reduction from crown fire to group torching. Caldecott Tunnel-PDM and HP002 exhibited little reduction because of the dense shrub fuel load. TI006 is a partial eucalyptus stand removal. The model predicts that the proposed and connected actions would greatly reduce the number of structures threatened by ember casting from Caldecott Tunnel-PDM and proposed project areas HP002 and TI006.

Under the proposed and connected actions, the predicted impact to structures from ember cast was 119 compared with 4,590 under the no action alternative, a 97% reduction (see Figure 5.2-4 and Table 5.2-5). The 119 homes would be threatened by only three project areas, and 68 would be threatened by proposed project area SO001. The threat from SO001 would be generated by torching of oak trees mixed with shrubs.

The modeling indicates that the proposed and connected actions as a whole would be very successful at reducing fire hazard to structures in the vicinity of the project areas. The modeling is useful as a comparative analysis tool showing before and after effects. However, many variables would be involved in interpreting and implementing the proposed and connected actions on the ground. The way they would be implemented could affect fire behavior. Environmental conditions are also quite variable and at any given time could be different than those used for the modeling. The model outputs should be used as a general indication of how effective the proposed and connected actions would be.

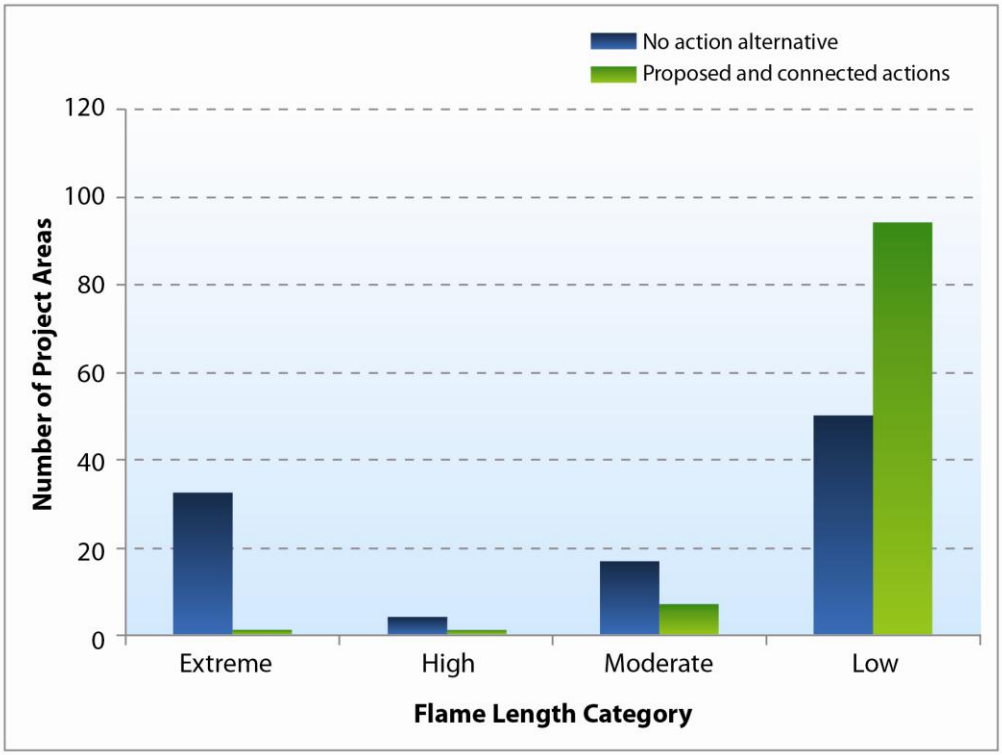

Figure 5.2-1. Project Areas in Each Flame Length Category

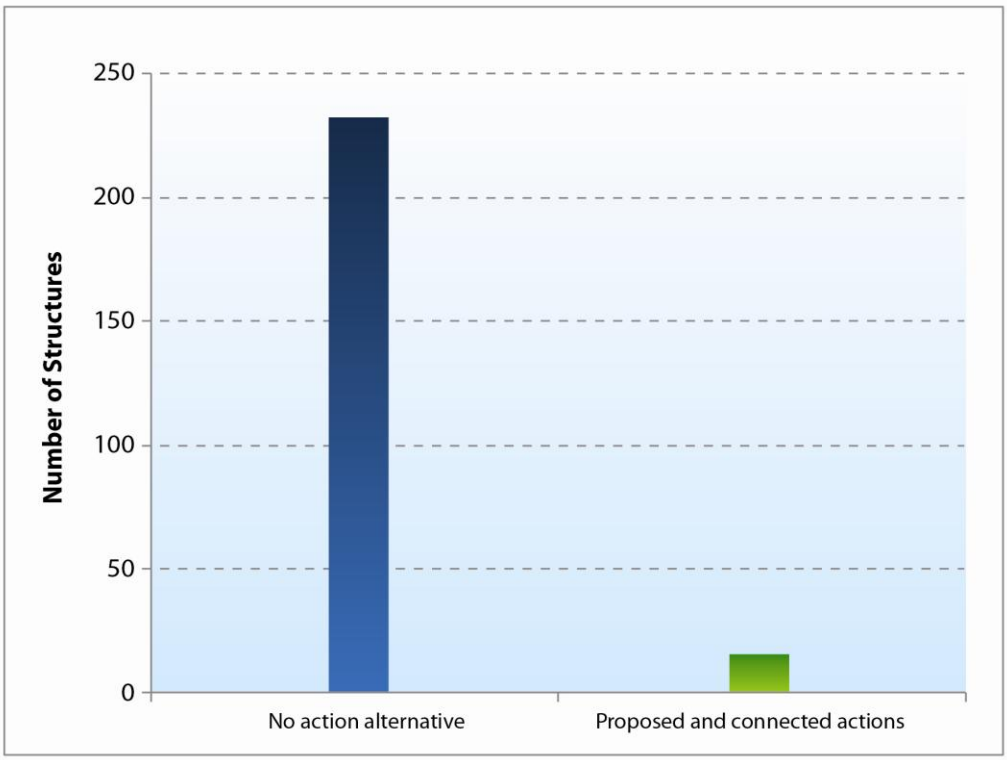

Figure 5.2-2. Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet in the Project Areas

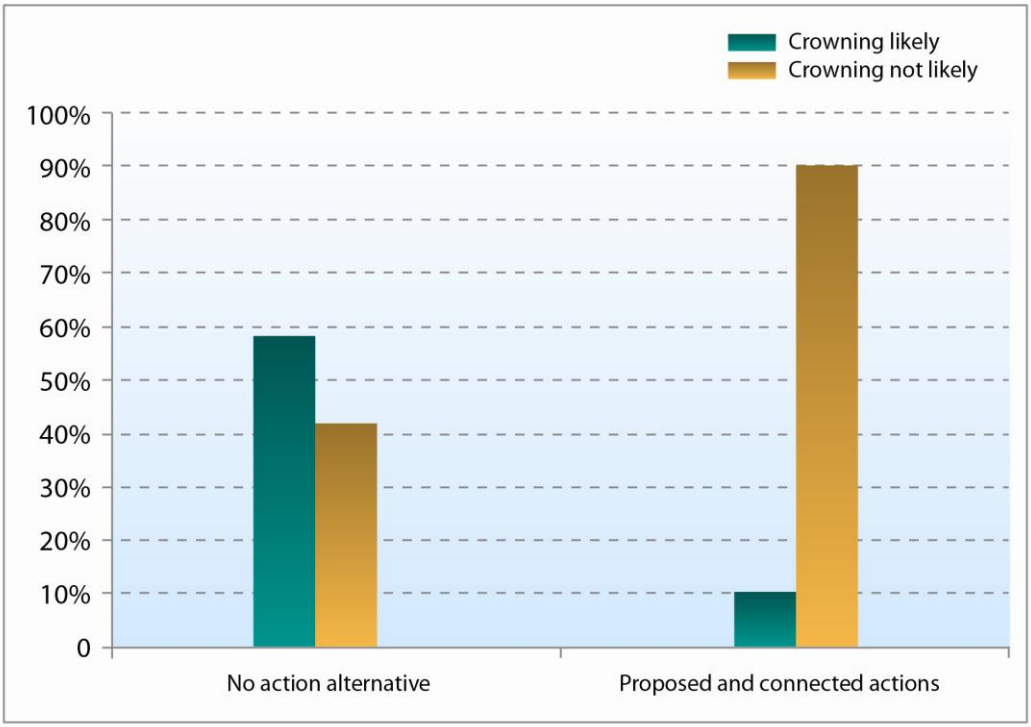

Figure 5.2-3. Percentage of Project Areas Where Crown Fire Is Likely

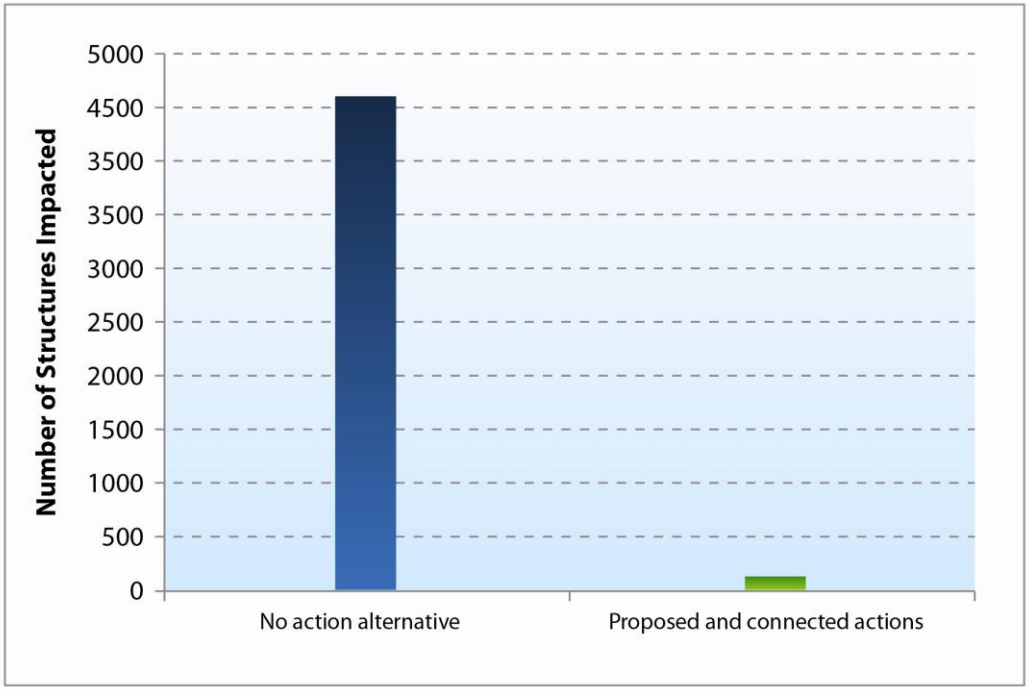

Figure 5.2-4. Structures Impacted by Ember Cast From Crown Fire

Table 5.2-2. Flame Length Category for Each Project Area

Project Area	Acreage	No Action Alternative—Flame Length Category	Proposed and Connected Actions—Flame Length Category
Connected AC001	5.32	Low	Low
Connected AC006	5.26	Low	Moderate
Connected AC007	89.13	Extreme	Moderate
Connected AC010	90.06	Low	Moderate
Connected AC011	85.96	Low	Moderate
Connected AC012	9.46	Extreme	Low
Connected AC013	192.56	Extreme	Low
Connected AC014	0.41	Low	Low
Connected CC001	3.04	High	Low
Connected CC002	6.16	Low	Low
Connected CC003	11.06	Extreme	Moderate
Connected CC004	2.55	Low	Low
Connected CC005	0.64	Extreme	Low
Connected CC008	0.28	Low	Low
Connected CC009	65.63	Moderate	Extreme
Connected CC010	0.81	Low	Low
Connected CC011	40.21	Extreme	Moderate
Connected HP004	0.32	Low	Low
Connected RD001	65.88	Extreme	Moderate
Connected RD003	15.79	Low	Low
Connected RD004	0.52	Low	Moderate
Connected RD008	3.66	Moderate	Moderate
Connected RD009	6.73	Moderate	Low
Connected SR002a	28.31	Moderate	Moderate
Connected SR002b	15.90	High	Moderate
Connected SR003	12.55	Low	Low
Connected SR005	14.61	Extreme	Moderate
Connected SR006	38.39	Low	Moderate
Connected SR007	8.68	Low	Low
Connected TI006	6.77	Low	Low
Connected TI008a	28.76	Moderate	Low
Connected TI008b	2.56	Low	Low
Connected TI009	25.98	Low	Moderate
Connected TI010	27.85	Low	Low
Connected TI011	22.21	Low	Moderate
Connected TI012	36.23	Low	Moderate
Connected TI014	0.72	Low	Low
Connected TI015	6.93	Low	Moderate
Connected TI018	0.61	Low	Low
Connected TI019	2.04	Low	Low
Connected TI020	15.75	Moderate	Low
Connected TI021	17.78	Low	Low
Connected WC005	44.31	Low	Low
Connected WC006	1.19	Moderate	Low

Table 5.2-2. Flame Length Category for Each Project Area

Project Area	Acreage	No Action Alternative—Flame Length Category	Proposed and Connected Actions—Flame Length Category
Connected WC011	1.13	Low	Low
Proposed AC001	4.32	Low	Low
Proposed AC002	2.48	Low	Low
Proposed AC003	4.75	Extreme	Low
Proposed AC006	25.52	Low	Moderate
Proposed AC007	8.44	Extreme	Moderate
Proposed AC011	26.15	Moderate	Moderate
Proposed AC012	18.93	Extreme	Moderate
Proposed AC013	16.85	Low	Moderate
Proposed AC014	92.55	Extreme	Moderate
Proposed Caldecott Tunnel-PDM	53.62	Extreme	Extreme
Proposed CC001	2.28	Extreme	Low
Proposed CC001-PDM	13.65	Low	Moderate
Proposed CC003	2.74	High	Moderate
Proposed CC006	3.34	Moderate	Low
Proposed CC007	1.72	Extreme	Low
Proposed CC008	3.72	Low	Moderate
Proposed CC010	5.36	Low	Moderate
Proposed CC012	2.40	Extreme	Moderate
Proposed Claremont-PDM	42.81	Extreme	Extreme
Proposed Frowning Ridge-PDM	185.18	Extreme	Extreme
Proposed HP001	1.71	Extreme	Moderate
Proposed HP002	13.62	Extreme	Extreme
Proposed HP003	1.12	Extreme	Moderate
Proposed HP004	1.31	Low	Moderate
Proposed LC010	4.79	Extreme	Low
Proposed LE005	4.58	Moderate	Low
Proposed MK001	5.91	Moderate	Low
Proposed MK002	0.45	Extreme	High
Proposed MK003	2.69	Low	Low
Proposed MK004	3.16	Moderate	Moderate
Proposed MK005	10.01	Moderate	High
Proposed North Hills-Skyline-PDM	68.34	Extreme	High
Proposed RD001	0.23	Low	Low
Proposed RD002	5.01	High	Moderate
Proposed RD003	11.82	Moderate	Moderate
Proposed RD004	27.80	Low	Moderate
Proposed RD005a	1.10	Low	Low
Proposed RD005b	8.45	Low	Moderate
Proposed RD009	2.92	Low	Low
Proposed RD011	1.02	Extreme	Low

Table 5.2-2. Flame Length Category for Each Project Area

Project Area	Acreage	No Action Alternative—Flame Length Category	Proposed and Connected Actions—Flame Length Category
Proposed SO001	4.05	Extreme	Extreme
Proposed SR001	7.88	Moderate	High
Proposed SR003	3.92	Low	Low
Proposed SR004	12.94	Low	Moderate
Proposed SR005	22.79	Low	Moderate
Proposed Strawberry Canyon-PDM	56.34	Extreme	Moderate
Proposed TI006	3.97	Extreme	Extreme
Proposed TI012	41.65	Extreme	Moderate
Proposed TI012-PDM	12.93	Low	Moderate
Proposed TI013	15.71	Moderate	Moderate
Proposed TI014	2.82	Low	Low
Proposed TI015	45.64	Low	Moderate
Proposed TI015-PDM	1.46	Low	Low
Proposed TI016	1.36	Extreme	Low
Proposed TI022	6.44	Low	Moderate
Proposed WC003	1.67	Moderate	Low
Proposed WC004	7.96	Low	Moderate
Proposed WC009	11.47	Extreme	Low
Proposed WC010	10.79	Extreme	Low
Proposed WC011	33.71	Extreme	Low

Table 5.2-3. Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet

Project Name	Acreage	No Action Alternative—Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet	Proposed and Connection Actions—Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet	Number of Structures Mitigated by Proposed and Connected Actions
Connected AC001	5.32	0	0	0
Connected AC006	5.26	0	0	0
Connected AC007	89.13	8	0	8
Connected AC010	90.06	0	0	0
Connected AC011	85.96	0	0	0
Connected AC012	9.46	0	0	0
Connected AC013	192.56	0	0	0
Connected AC014	0.41	0	0	0
Connected CC001	3.04	4	0	4
Connected CC002	6.16	0	0	0
Connected CC003	11.06	3	0	3
Connected CC004	2.55	6	0	6
Connected CC005	0.64	1	0	1
Connected CC008	0.28	1	0	1
Connected CC009	65.63	2	0	2
Connected CC010	0.81	0	0	0

Table 5.2-3. Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet

Project Name	Acreage	No Action Alternative— Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet	Proposed and Connection Actions— Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet	Number of Structures Mitigated by Proposed and Connected Actions
Connected CC011	40.21	12	0	12
Connected HP004	0.32	0	0	0
Connected RD001	65.88	0	0	0
Connected RD003	15.79	0	0	0
Connected RD004	0.52	0	0	0
Connected RD008	3.66	0	0	0
Connected RD009	6.73	3	0	3
Connected SR002a	28.31	6	0	6
Connected SR002b	15.90	10	0	10
Connected SR003	12.55	2	0	2
Connected SR005	14.61	0	0	0
Connected SR006	38.39	0	0	0
Connected SR007	8.68	0	0	0
Connected TI006	6.77	0	0	0
Connected TI008a	28.76	0	0	0
Connected TI008b	2.56	0	0	0
Connected TI009	25.98	0	0	0
Connected TI010	27.85	0	0	0
Connected TI011	22.21	0	0	0
Connected TI012	36.23	0	0	0
Connected TI014	0.72	0	0	0
Connected TI015	6.93	0	0	0
Connected TI018	0.61	0	0	0
Connected TI019	2.04	0	0	0
Connected TI020	15.75	0	0	0
Connected TI021	17.78	0	0	0
Connected WC005	44.31	1	0	1
Connected WC006	1.19	0	0	0
Connected WC011	1.13	6	0	6
Proposed AC001	4.32	2	0	2
Proposed AC002	2.48	0	0	0
Proposed AC003	4.75	1	0	1
Proposed AC006	25.52	0	0	0
Proposed AC007	8.44	3	0	3
Proposed AC011	26.15	0	0	0
Proposed AC012	18.93	0	0	0
Proposed AC013	16.85	0	0	0
Proposed AC014	92.55	0	0	0
Proposed	53.62	0	0	0

Table 5.2-3. Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet

Project Name	Acreage	No Action Alternative— Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet	Proposed and Connection Actions— Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet	Number of Structures Mitigated by Proposed and Connected Actions
Caldecott Tunnel-PDM				
Proposed CC001	2.28	5	0	5
Proposed CC001-PDM	13.65	0	0	0
Proposed CC003	2.74	1	0	1
Proposed CC006	3.34	1	0	1
Proposed CC007	1.72	0	0	0
Proposed CC008	3.72	1	0	1
Proposed CC010	5.36	4	0	4
Proposed CC012	2.40	1	0	1
Proposed Claremont-PDM	42.81	0	0	0
Proposed Frowning Ridge-PDM	185.18	2	1	1
Proposed HP001	1.71	0	0	0
Proposed HP002	13.62	23	2	21
Proposed HP003	1.12	2	0	2
Proposed HP004	1.31	0	0	0
Proposed LC010	4.79	8	0	8
Proposed LE005	4.58	0	0	0
Proposed MK001	5.91	1	0	1
Proposed MK002	0.45	0	0	0
Proposed MK003	2.69	0	0	0
Proposed MK004	3.16	0	0	0
Proposed MK005	10.01	3	3	0
Proposed North Hills-Skyline-PDM	68.34	15	3	12
Proposed RD001	0.23	0	0	0
Proposed RD002	5.01	1	0	1
Proposed RD003	11.82	0	0	0
Proposed RD004	27.80	1	0	1
Proposed RD005a	1.10	0	0	0
Proposed RD005b	8.45	0	0	0
Proposed RD009	2.92	2	0	2
Proposed RD011	1.02	0	0	0
Proposed SO001	4.05	3	3	0
Proposed SR001	7.88	1	0	1
Proposed SR003	3.92	0	0	0
Proposed SR004	12.94	0	0	0
Proposed SR005	22.79	0	0	0
Proposed Strawberry	56.34	17	0	17

Table 5.2-3. Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet

Project Name	Acreage	No Action Alternative— Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet	Proposed and Connection Actions— Structures Within 200 Feet of Flame Lengths Greater Than 8 Feet	Number of Structures Mitigated by Proposed and Connected Actions
Canyon-PDM				
Proposed TI006	3.97	9	4	5
Proposed TI012	41.65	7	0	7
Proposed TI012-PDM	12.93	0	0	0
Proposed TI013	15.71	1	1	0
Proposed TI014	2.82	0	0	0
Proposed TI015	45.64	4	0	4
Proposed TI015-PDM	1.46	0	0	0
Proposed TI016	1.36	0	0	0
Proposed TI022	6.44	0	0	0
Proposed WC003	1.67	0	0	0
Proposed WC004	7.96	11	0	11
Proposed WC009	11.47	8	0	8
Proposed WC010	10.79	7	0	7
Proposed WC011	33.71	66	0	66
Total	2,059.0	276	17	259

Table 5.2-4. Crown Fire Prediction for Each Project Area

Project Name	Acreage	No Action Alternative— Presence of Group Torching or Active Crowning in Project Area	Proposed and Connection Actions— Presence of Group Torching or Active Crowning in Project Area
Connected AC001	5.32	No	No
Connected AC006	5.26	No	No
Connected AC007	89.13	Yes	No
Connected AC010	90.06	Yes	No
Connected AC011	85.96	Yes	No
Connected AC012	9.46	Yes	No
Connected AC013	192.56	Yes	No
Connected AC014	0.41	No	No
Connected CC001	3.04	Yes	No
Connected CC002	6.16	No	No
Connected CC003	11.06	Yes	No
Connected CC004	2.55	No	No
Connected CC005	0.64	Yes	No
Connected CC008	0.28	No	No
Connected CC009	65.63	Yes	Yes

Table 5.2-4. Crown Fire Prediction for Each Project Area

Project Name	Acreage	No Action Alternative—Presence of Group Torching or Active Crowning in Project Area	Proposed and Connection Actions—Presence of Group Torching or Active Crowning in Project Area
Connected CC010	0.81	No	No
Connected CC011	40.21	Yes	No
Connected HP004	0.32	No	No
Connected RD001	65.88	Yes	No
Connected RD003	15.79	No	No
Connected RD004	0.52	No	No
Connected RD008	3.66	No	No
Connected RD009	6.73	Yes	No
Connected SR002a	28.31	Yes	No
Connected SR002b	15.90	Yes	No
Connected SR003	12.55	No	No
Connected SR005	14.61	Yes	No
Connected SR006	38.39	No	No
Connected SR007	8.68	No	No
Connected TI006	6.77	Yes	No
Connected TI008a	28.76	Yes	No
Connected TI008b	2.56	No	No
Connected TI009	25.98	No	No
Connected TI010	27.85	No	No
Connected TI011	22.21	No	No
Connected TI012	36.23	Yes	No
Connected TI014	0.72	No	No
Connected TI015	6.93	No	No
Connected TI018	0.61	No	No
Connected TI019	2.04	No	No
Connected TI020	15.75	Yes	No
Connected TI021	17.78	No	No
Connected WC005	44.31	No	No
Connected WC006	1.19	Yes	No
Connected WC011	1.13	No	No
Proposed AC001	4.32	Yes	No
Proposed AC002	2.48	No	No
Proposed AC003	4.75	Yes	No
Proposed AC006	25.52	No	No
Proposed AC007	8.44	Yes	No
Proposed AC011	26.15	Yes	No
Proposed AC012	18.93	Yes	No

Table 5.2-4. Crown Fire Prediction for Each Project Area

Project Name	Acreage	No Action Alternative—Presence of Group Torching or Active Crowning in Project Area	Proposed and Connection Actions—Presence of Group Torching or Active Crowning in Project Area
Proposed AC013	16.85	No	No
Proposed AC014	92.55	Yes	No
Proposed Caldecott Tunnel-PDM	53.62	Yes	Yes
Proposed CC001	2.28	Yes	No
Proposed CC001-PDM	13.65	No	No
Proposed CC003	2.74	Yes	No
Proposed CC006	3.34	Yes	No
Proposed CC007	1.72	Yes	No
Proposed CC008	3.72	Yes	No
Proposed CC010	5.36	Yes	No
Proposed CC012	2.40	Yes	No
Proposed Claremont-PDM	42.81	Yes	Yes
Proposed Frowning Ridge-PDM	185.18	Yes	Yes
Proposed HP001	1.71	Yes	No
Proposed HP002	13.62	Yes	Yes
Proposed HP003	1.12	No	No
Proposed HP004	1.31	No	No
Proposed LC010	4.79	Yes	No
Proposed LE005	4.58	Yes	No
Proposed MK001	5.91	No	No
Proposed MK002	0.45	Yes	Yes
Proposed MK003	2.69	No	No
Proposed MK004	3.16	Yes	Yes
Proposed MK005	10.01	Yes	Yes
Proposed North Hills-Skyline-PDM	68.34	Yes	No
Proposed RD001	0.23	No	No
Proposed RD002	5.01	Yes	No
Proposed RD003	11.82	Yes	No
Proposed RD004	27.80	No	No
Proposed RD005a	1.10	No	No
Proposed RD005b	8.45	No	No
Proposed RD009	2.92	No	No
Proposed RD011	1.02	Yes	No
Proposed SO001	4.05	Yes	Yes
Proposed SR001	7.88	Yes	Yes
Proposed SR003	3.92	No	No

Table 5.2-4. Crown Fire Prediction for Each Project Area

Project Name	Acreage	No Action Alternative— Presence of Group Torching or Active Crowning in Project Area	Proposed and Connection Actions— Presence of Group Torching or Active Crowning in Project Area
Proposed SR004	12.94	No	No
Proposed SR005	22.79	Yes	No
Proposed Strawberry Canyon-PDM	56.34	Yes	No
Proposed TI006	3.97	Yes	Yes
Proposed TI012	41.65	Yes	No
Proposed TI012-PDM	12.93	Yes	No
Proposed TI013	15.71	Yes	No
Proposed TI014	2.82	No	No
Proposed TI015	45.64	Yes	No
Proposed TI015-PDM	1.46	No	No
Proposed TI016	1.36	Yes	No
Proposed TI022	6.44	No	No
Proposed WC003	1.67	No	No
Proposed WC004	7.96	Yes	No
Proposed WC009	11.47	Yes	No
Proposed WC010	10.79	Yes	No
Proposed WC011	33.71	Yes	No

Table 5.2-5. Structures Impacted by Ember Cast in Each Project Area

Project Area	Acreage	No Action Alternative— Structures Impacted by Ember Cast	Proposed and Connected Actions— Structures Impacted By Ember Cast
Connected AC001	5.32	0	0
Connected AC006	5.26	0	0
Connected AC007	89.13	174	0
Connected AC010	90.06	0	0
Connected AC011	85.96	0	0
Connected AC012	9.46	0	0
Connected AC013	192.56	4	0
Connected AC014	0.41	0	0
Connected CC001	3.04	475	0
Connected CC002	6.16	0	0
Connected CC003	11.06	56	0
Connected CC004	2.55	0	0
Connected CC005	0.64	297	0
Connected CC008	0.28	0	0
Connected CC009	65.63	126	0

Table 5.2-5. Structures Impacted by Ember Cast in Each Project Area

Project Area	Acreage	No Action Alternative—Structures Impacted by Ember Cast	Proposed and Connected Actions—Structures Impacted By Ember Cast
Connected CC010	0.81	0	0
Connected CC011	40.21	150	0
Connected HP004	0.32	0	0
Connected RD001	65.88	0	0
Connected RD003	15.79	0	0
Connected RD004	0.52	0	0
Connected RD008	3.66	0	0
Connected RD009	6.73	7	0
Connected SR002a	28.31	424	0
Connected SR002b	15.90	220	0
Connected SR003	12.55	0	0
Connected SR005	14.61	121	0
Connected SR006	38.39	0	0
Connected SR007	8.68	0	0
Connected TI006	6.77	39	0
Connected TI008a	28.76	0	0
Connected TI008b	2.56	0	0
Connected TI009	25.98	0	0
Connected TI010	27.85	0	0
Connected TI011	22.21	0	0
Connected TI012	36.23	59	0
Connected TI014	0.72	0	0
Connected TI015	6.93	0	0
Connected TI018	0.61	0	0
Connected TI019	2.04	0	0
Connected TI020	15.75	0	0
Connected TI021	17.78	0	0
Connected WC005	44.31	0	0
Connected WC006	1.19	0	0
Connected WC011	1.13	0	0
Proposed AC001	4.32	29	0
Proposed AC002	2.48	0	0
Proposed AC003	4.75	42	0
Proposed AC006	25.52	0	0
Proposed AC007	8.44	51	0
Proposed AC011	26.15	0	0
Proposed AC012	18.93	0	0
Proposed AC013	16.85	0	0

Table 5.2-5. Structures Impacted by Ember Cast in Each Project Area

Project Area	Acreage	No Action Alternative—Structures Impacted by Ember Cast	Proposed and Connected Actions—Structures Impacted By Ember Cast
Proposed AC014	92.55	1	0
Proposed Caldecott Tunnel-PDM	53.62	374	30
Proposed CC001	2.28	96	0
Proposed CC001-PDM	13.65	0	0
Proposed CC003	2.74	57	0
Proposed CC006	3.34	88	0
Proposed CC007	1.72	52	0
Proposed CC008	3.72	35	0
Proposed CC010	5.36	32	0
Proposed CC012	2.40	9	0
Proposed Claremont-PDM	42.81	36	0
Proposed Frowning Ridge-PDM	185.18	36	21
Proposed HP001	1.71	392	0
Proposed HP002	13.62	195	0
Proposed HP003	1.12	0	0
Proposed HP004	1.31	0	0
Proposed LC010	4.79	82	0
Proposed LE005	4.58	12	0
Proposed MK001	5.91	0	0
Proposed MK002	0.45	0	0
Proposed MK003	2.69	0	0
Proposed MK004	3.16	40	0
Proposed MK005	10.01	169	0
Proposed North Hills-Skyline-PDM	68.34	159	0
Proposed RD001	0.23	0	0
Proposed RD002	5.01	558	0
Proposed RD003	11.82	2	0
Proposed RD004	27.80	0	0
Proposed RD005a	1.10	0	0
Proposed RD005b	8.45	0	0
Proposed RD009	2.92	0	0
Proposed RD011	1.02	0	0
Proposed SO001	4.05	68	68
Proposed SR001	7.88	5	0
Proposed SR003	3.92	0	0
Proposed SR004	12.94	0	0
Proposed SR005	22.79	0	0
Proposed Strawberry Canyon-PDM	56.34	476	0

Table 5.2-5. Structures Impacted by Ember Cast in Each Project Area

Project Area	Acreage	No Action Alternative—Structures Impacted by Ember Cast	Proposed and Connected Actions—Structures Impacted By Ember Cast
Proposed TI006	3.97	118	0
Proposed TI012	41.65	247	0
Proposed TI012-PDM	12.93	0	0
Proposed TI013	15.71	4	0
Proposed TI014	2.82	0	0
Proposed TI015	45.64	13	0
Proposed TI015-PDM	1.46	0	0
Proposed TI016	1.36	18	0
Proposed TI022	6.44	0	0
Proposed WC003	1.67	0	0
Proposed WC004	7.96	0	0
Proposed WC009	11.47	89	0
Proposed WC010	10.79	78	0
Proposed WC011	33.71	644	0
Total	**2,059.0**	**6,459**	**119**

5.3 Geology, Seismicity, and Soils

The following sections describe the environmental consequences related to geology, seismicity, and soils associated with the proposed and connected actions and the no action alternative.

5.3.1 Geology, Seismicity, and Seismic Hazards

This section describes the thresholds of significance and potential effects to geology, seismicity, and seismic hazards.

5.3.1.1 Effect Assessment Methodology

The environmental consequences of the proposed and connected actions and the no action alternative were analyzed qualitatively, based on a review of the geologic data presented in Section 4.4. Analysis of potential effects focuses on the potential to increase the risk of personal injury, loss of life, and damage to property.

5.3.1.1.1 Determination of Adverse Effects

Effects to geology, seismicity, and seismic hazards would be considered significant if they would:

- Expose people or structures to adverse effects from the rupture of a known earthquake fault
- Expose people or structures to major geologic hazards that could result in loss, injury, or death related to strong seismic ground shaking, including liquefaction and landslides
- Be located on a geologic unit that is unstable or would become unstable as a result of the proposed and connected actions or the no action alternative and potentially result in on or offsite landslide, lateral spreading, liquefaction, or collapse

5.3.1.2 Effects Analysis

5.3.1.2.1 No Action Alternative

Under the no action alternative, the subapplicants would continue their current hazardous fire risk reduction practices, described in Section 3.4.1. The risk of earthquakes and other geologic hazards would be essentially the same as under existing conditions.

5.3.1.2.2 Proposed and Connected Actions

Implementation of the proposed and connected actions would have no effect on geology or seismicity. The proposed and connected actions would not expose people or structures to seismic hazards, including the rupture of a known earthquake fault because the actions would not build structures and would not draw more people to the seismically active region. There would be no significant adverse effects.

5.3.1.3 Avoidance and Mitigation Measures

No avoidance or mitigation measures are proposed for effects on geology and seismicity or for seismic hazards.

5.3.2 Soils

This section describes the thresholds of significance and potential effects to soils.

5.3.2.1 Effect Assessment Methodology

5.3.2.1.1 Determination of Significant Effects

Effects to soils would be significant if they would:

- Result in adverse effects related to soil erosion, loss of topsoil, or increased landslides from unstable soils
- Significantly reduce soil productivity
- Result in adverse effects, including a risk to life or property, as a result of being located on expansive soils

5.3.2.2 Effects Analysis

5.3.2.2.1 No Action Alternative

Under the no action alternative, a major wildfire would be more likely. Wildfires can result in significant land disturbance and loss of vegetation, creating conditions that can lead to soil erosion. Thus, under the no action alternative, there is potential for higher levels of soil erosion following wildfires.

As described in Section 4.4, the U.S. Forest Service Water Erosion Prediction Project (WEPP) fuel management erosion analysis (FuME) model was used to analyze potential erosion under existing (assumed to be relatively undisturbed) forest vegetation conditions and following implementation of the no action and proposed and connected actions. For the no action alternative, the model generates values for background sedimentation. Background sedimentation takes into account the amount of erosion from undisturbed forest, the amount of erosion from a future potential wildfire in the absence of fuel management activities, and the amount of erosion attributable to no and low traffic road conditions. Table 5.3-1 summarizes the average annual sedimentation (tons/acre/year) under the no action alternative, as modeled at the seven sites described in Section 4.4.

The proposed and connected project areas are also at risk of wildfire due to high vegetative fuel loads. Because of this risk, the no action erosion modeling accounts for the potential future occurrence of a wildfire and the erosion that could occur following a wildfire under this alternative. There is also a potential that a wildfire would not occur under the no action alternative. Total average annual erosion under a “no wildfire” scenario is also shown in Table 5.3-1.

Table 5.3-1. Average Annual Sediment for No Action[(1)] Conditions Based on WEPP Modeling

Site ID	Average Annual Sediment (tons/acre/year)					
	Soil Texture	Undisturbed Forest	Wildfire	Low Access Roads	Total Average Annual Sediment (tons/acre/year)	Total Average Annual Sediment without Wildfire (tons/acre/year)
1	Loam	0.030	0.105	0.005 to 0.020	**0.140 to 0.155**	**0.035 to 0.050**
2	Clay loam	0.080	0.077	0.005 to 0.018	**0.162 to 0.175**	**0.085 to 0.098**
3	Loam	0.040	0.111	0.006 to 0.021	**0.157 to 0.172**	**0.046 to 0.061**
4	Silt loam	0.070	0.119	0.005 to 0.019	**0.194 to 0.208**	**0.075 to 0.089**
5	Loam	0.040	0.112	0.006 to 0.021	**0.158 to 0.173**	**0.046 to 0.061**
6	Silt loam	0.060	0.106	0.004 to 0.016	**0.170 to 0.182**	**0.064 to 0.076**
7	Silt loam	0	0.011	0.001 to 0.002	**0.012 to 0.013**	**0.001 to 0.002**

WEPP = Water Erosion Prediction Project

(1) No action conditions assume the undisturbed forest modeling result, plus the wildfire modeling result (areas would be prone to wildfire under the no action alternative), plus the low access roads modeling result.

No new structures or infrastructure would be constructed under the no action alternative that would be subject to risks from expansive soils. There would be no significant adverse effect.

5.3.2.2.2 Proposed and Connected Actions

Erosion

Surface erosion occurs when sites are disturbed or when soil vegetation cover is reduced. As described in Section 4.4, the proposed and connected project areas are currently covered with native and non-native vegetation and forest litter. This vegetation and litter protects the soils from significant erosion.

The WEPP FuME modeling output generates results for sedimentation rates following fuel reduction activities. The total average annual erosion rate for the proposed and connected actions takes into account the erosion generated the year following fuel reduction averaged over the fuel reduction period of once every 20 years, the background erosion for undisturbed forest conditions (including erosion attributable to low traffic roads in the project areas), and the erosion attributable to higher traffic volumes assumed to result from fuel management activities. Table 5.3-2 summarizes erosion rates at the seven modeled sites resulting from implementation of the proposed and connected actions.

Wildfires occurring after implementation of the proposed and connected actions would be less severe than wildfires occurring under the no action alternative. Table 5.3-2 summarizes the average annual total erosion rates for the proposed and connected actions with and without a potential future wildfire. Table 5.3-3 summarizes the average annual total erosion rates for the no action and proposed and connected actions with and without potential future high or low severity wildfires.

Table 5.3-2. Average Annual Erosion for Proposed and Connected Actions Based on WEPP Modeling

Site ID	Sediment in Year of Disturbance (as a result of fuel reduction) (tons/acre)	Sediment Rates (tons/acre/year)					
		Average Annual Sediment – Undisturbed[1]	Low Severity Wildfire Sediment[2]	Average Annual Sediment – Fuel Reduction	Average Annual Sediment – High Access Roads	Average Annual Total with Wildfire	Average Annual Total without Wildfire
1	0.040	0.035 to 0.050	0.017	0.002	0.018 to 0.029	0.072 to 0.098	0.055 to 0.081
2	0.080	0.085 to 0.098	0.017	0.004	0.016 to 0.023	0.122 to 0.142	0.105 to 0.125
3	0.050	0.046 to 0.061	0.018	0.003	0.019 to 0.033	0.086 to 0.115	0.068 to 0.097
4	0.120	0.075 to 0.089	0.035	0.006	0.016 to 0.032	0.132 to 0.162	0.097 to 0.127
5	0.050	0.046 to 0.061	0.018	0.003	0.019 to 0.033	0.086 to 0.115	0.068 to 0.097
6	0.110	0.064 to 0.076	0.031	0.005	0.014 to 0.025	0.114 to 0.137	0.083 to 0.106
7	0.010	0.001 to 0.002	0.002	0.001	0.001 to 0.004	0.005 to 0.009	0.003 to 0.007

WEPP = Water Erosion Prediction Project

(1) It is assumed that fuel management under the proposed and connected actions would reduce or eliminate wildfires from the watershed area; therefore, the undisturbed rate in this table consists of the undisturbed forest rate in Table 5.3-1, plus the low access road rate, and does not include the wildfire rate.

(2) To account for the lower severity of potential wildfires under the proposed and connected actions, the low severity wildfire rate is used. Return period of disturbance of low severity wildfire assumed to be 100 years.

Table 5.3-3. Comparison of Total Average Annual Sedimentation under No Action and Proposed and Connected Actions

Site ID	Total Average Annual Sediment – No Action		Total Average Annual Sediment – Proposed and Connected Actions	
	Scenario A	Scenario B	Scenario C	Scenario D
	Wildfire	No Wildfire	Wildfire	No Wildfire
1	0.140 to 0.155	0.035 to 0.050	0.072 to 0.098	0.055 to 0.081
2	0.162 to 0.175	0.085 to 0.098	0.122 to 0.142	0.105 to 0.125
3	0.157 to 0.172	0.046 to 0.061	0.086 to 0.115	0.068 to 0.097
4	0.194 to 0.208	0.075 to 0.089	0.132 to 0.162	0.097 to 0.127
5	0.158 to 0.173	0.046 to 0.061	0.086 to 0.115	0.068 to 0.097
6	0.170 to 0.182	0.064 to 0.076	0.114 to 0.137	0.083 to 0.106
7	0.012 to 0.013	0.001 to 0.002	0.005 to 0.009	0.003 to 0.007

Removal and suppression of vegetation and resulting decay of root systems can decrease the cohesive properties of soils and increase soil moisture content due to a lack of evapotranspiration (Rice 1977). These conditions, in addition to steep slopes, and the occurrence of wildfire create conditions favorable to soil erosion and increase the risk of landslides. As shown in Table 5.3-3, WEPP modeling results indicate that the proposed and connected actions in the absence of wildfire (Scenario D in Table 5.3-3) would result in greater average annual erosion rates than the no action alternative in the absence of wildfire (Scenario B). These potential effects of the proposed and connected actions would be significant and adverse.

Many proposed and connected project areas are designated as being at risk for wildfire due to a lack of vegetation management. In addition, under recent drought conditions, wildfires can occur and spread even when vegetation is managed for wildfire reduction. However, the purpose of fuel management is to reduce the severity of potential future wildfires. As shown in Table 5.3-3,

when potential future wildfires are taken into consideration (Scenarios A and C), the total average annual soil erosion under the proposed and connected actions is less than under the no action alternative. This is because the severity of wildfire would likely be less under the proposed and connected actions. Decreased erosion rates would be a beneficial effect.

In order to mitigate potential significant adverse effects related to soil erosion, mitigation measures and best management practices are described below (Section 5.3.2.3). Implementation of Mitigation Measure GEO-1 by all subapplicants, in addition to implementation of best management practices incorporated as part of the proposed and connected actions, would reduce adverse effects from soil erosion and landslides. Overall, soil erosion and landslide effects from implementation of the proposed and connected actions would not be significant.

Effects of Wood Chips

Many downed trees would be chipped, and the wood chips would be spread over approximately 20% of each proposed and connected project area to a maximum depth of 2 feet. Research shows that a layer of wood chips, including eucalyptus wood chips, increases the percentage of organic matter in soil and leads to higher water infiltration (U.S. Department of Agriculture [USDA] 2005). Eucalyptus chips have been shown to moderate soil temperatures and promote water conservation in soils (May 2003). Battaglia et al. (2009) found that at a mulch depth of 12.5 centimeters (cm), understory vegetation was almost fully suppressed in ponderosa pine forests. At a mulch depth of 9 cm, understory vegetation was almost fully suppressed in pinyon-juniper forests. Mulch treatments also alter the inputs of nitrogen and carbon and the availability of plant available forms of soil nitrogen (Battaglia et al. 2009). Battaglia et al. and other studies they cite showed that application of mulch reduces inorganic soil nitrogen by providing soil microbes a source of carbon that stimulates their growth and uptake of soil nitrogen (Morgan 1994; Zink and Allen 1998; Binkley et al. 2003; and Blumenthal 2009 as cited in Battaglia et al. 2009). Since forest growth is commonly limited by nitrogen supply, mulch application may lead to a substantial reduction in tree growth in some sites (Battaglia et al. 2009). Application of wood chips is likely to reduce soil erosion and delay regrowth of woody vegetation on the 20% of each project area where wood chips would be spread.

Decomposition of Wood Chips

Few research results are available on the rate at which chipped or shredded wood decomposes. In the available research, decomposition was measured for 1 or 2 years. The studies did not continue until decomposition was complete. Because decomposition of wood chips is caused primarily by microorganisms feeding on the surface of the chips, the amount of decomposition in the first year is probably roughly suggestive of the amount decomposed in subsequent years, as the microorganisms eat their way through the chips. The rates of decomposition observed in several 1- and 2-year studies suggest that substantially complete decomposition would take 5 to 10 years. All of the studies were conducted outdoors and were therefore influenced by the local climate.

Duryea et al. (1999) found that 21% of shredded eucalyptus mulch decomposed in 1 year. This study was conducted in Gainesville, Florida, which is warmer than the East Bay Hills in every month of the year and has almost twice as much rain as the City of Oakland. Gainesville has a

wet season during the warmest months when the East Bay Hills have a dry season. Moisture and a warm climate encourage microbial activity and increase the rate of decomposition. Shredded mulch is generally finer than wood chips, and finer material decomposes faster because its surface area is larger in comparison to its volume.

The Gainesville study included measurements of microbial respiration in the mulch, which should be proportional to microbial activity and therefore to the rate of decomposition. Respiration was measured at different temperatures. The respiration rate was significantly lower at temperatures typical of the East Bay Hills than at temperatures representative of the warm months in Gainesville. This indicates that the rate of decomposition would be lower in the East Bay Hills. Based on the results of this study, it appears likely that the decomposition rate in the East Bay Hills would be closer to 10% per year than to 21%, and substantially complete decomposition could take 10 years.

A 2-year study in Ruakura, New Zealand, measured the decrease in the depth of various mulches rather than reduction of mass. Average temperature in Ruakura is not much higher than in Oakland, but precipitation is about 40 inches a year compared to 24 in Oakland. Ruakura does not have a dry season. The study included coarse wood chips of an unidentified species and also included shredded eucalyptus mulch with “a significant fraction of leaves” (Faber and Spiers 2004). The eucalyptus mulch lost three quarters of its depth in the first year and more than 90% in 2 years. In contrast, the wood chips lost about 32% of their original depth in the first year and 48% in 2 years. The study report indicates that much of the decrease in depth in the first year resulted from compaction but that much of the decrease in the second year was due to decomposition. Compaction is greater in shredded mulch than in wood chips because shredded mulch contains more stringy fine material. The fineness of shredded mulch also causes it to decompose faster than wood chips. The study results indicate that the shredded eucalyptus mulch would have been substantially decomposed in 3 years.

At the rate of loss in the second year (16% of the original volume), the wood chips would be substantially decomposed in a total of between 5 and 6 years. Both shredded mulch and wood chips decompose faster in moister, warmer climates. It appears likely that the results for wood chips are more representative of how wood chips would decompose in the proposed and connected project areas in the East Bay Hills.

In 1952, Salomon conducted a study of the decomposition of pine wood chips in Kingston, Rhode Island, which is cooler than the East Bay Hills in most months but has twice the annual rainfall. In the study, approximately 41% of pine wood chips that began with diameters greater than one quarter inch decomposed in 2 years (Salomon 1952). This suggests that decomposition might be substantially complete after 5 years.

Overall Assessment of Impact to Soils

The proposed and connected actions would lower the risk of wildfire in the proposed and connected project areas. As described above, wildfire disturbs the landscape and removes vegetation that stabilizes soils. The selective vegetation management and soil stabilization methods under the proposed and connected actions would reduce the risk of uncontrolled wildfire and subsequent soil erosion and landslides. This would be a beneficial effect.

No new structures or infrastructure would be constructed under the proposed and connected actions that would be subject to risks from expansive soils. There would be no significant adverse effect.

5.3.2.3 Avoidance and Mitigation Measures

To reduce effects to soils resulting from soil erosion and loss of topsoil, the following best management practices would be implemented.

- Minimize soil disturbance during and following fuel reduction treatments and inspect disturbed areas for evidence of severe erosion as a result of vegetation management. If severe erosion is occurring at a site, only native plant seeds or stock would be used for erosion control unless otherwise approved by the U.S. Fish and Wildlife Service. If necessary, fencing, signs, maintenance, access control, jute fabric, sediment traps, mulch, straw wattles (without plastic monofilament netting), vegetation management, exotic species control, or any other commonly used erosion control technique may be used to promote the ecological health of the sites.
- Best management practices (BMPs), as identified by the California Regional Water Quality Control Board, would be implemented to control erosion during and after vegetation removal. Erosion control BMPs would include but may not be limited to:
  - Leaving tree stumps and/or root systems in place until vegetation becomes re-established in logged areas
  - Installing storm drain protection prior to vegetation management for project sites near storm drains
  - Placing a deep bed of chips around tree stumps to allow mechanical skidders to travel above the chip bed
  - Using wood chips and tree trunks retained behind stumps to create sediment traps roughly following the slope contours
  - Avoiding operation of heavy equipment on slopes steeper than 35% and developing specific measures to minimize effects of erosion if such areas are unavoidable
  - Stabilizing all entrances and exits to control erosion and sediment discharges from the sites
  - Cleaning and maintaining streets and roads in such a manner as to prevent unauthorized non-stormwater discharges from reaching surface water or MS4 drainage systems
  - Selecting mechanical treatments according to a site's topography, access, vegetation type, and potential for environmental impacts
- Vehicle and heavy equipment refueling and maintenance would only be permitted in designated disturbed/developed areas where accidental spills can be immediately contained. All project-related heavy equipment would be regularly maintained to avoid fluid leaks (e.g., gasoline, diesel fuel, hydraulic fluid). All leaking fluid would be stopped or captured in a container until such time that the equipment can be immediately moved

off site and repaired. Storage of hazardous materials would not occur within 500 feet of any pond or creek drainage. A plan would be prepared for immediate containment and clean-up of hazardous material spills within or adjacent to each site. Further water quality BMPs may include but would not be limited to:

- Avoiding crossing drainage areas with running or standing water with mechanical equipment while water is present.
- Complying with National Pollutant Discharge Elimination System stormwater permitting requirements and preparing stormwater pollution prevention plans.
- Applying herbicide to tree stumps and re-sprouts by hand during dry weather and low wind conditions.
- Using hand-fellers for trees within 50 feet of a drainage channel; these trees would be felled perpendicular to ephemeral drainages and processing would be done by a skidder, if the skidder could safely handle stems at 50-foot distance from drainage, otherwise, the trees would be lopped and scattered by hand fellers.
- Locating landings to accommodate skidding distances of up to 1,000 feet; for landings near streams, residue piles (sawdust, wood chips, etc.) would be placed away from drainages where runoff could wash residue into streams or wetlands.
- Avoiding skidding across dry or running streams; when that is not possible, temporary crossings would be used during the dry season while ephemeral creeks are dry.
- Taking all necessary safeguards to prevent sedimentation into watercourses during all phases of vegetation management activities.

In addition to the best management practices listed above, the following mitigation is proposed:

Mitigation Measure GEO-1: Prior to implementation of any proposed vegetation removal activity, the recommended treatment area must be screened for landslide activation risk using the following procedure:

1. Subapplicants must refer to:

- The most current available landslide mapping from the U.S. Geologic Survey (USGS) or the California Geological Survey for the proposed or connected project area (for example, the USGS 1997 Summary Distribution of Slides and Earth Flows in the San Francisco Bay Region, California. OFR 97-745c).
- Geographic information systems slope steepness mapping for the proposed or connected project area.

2. If all of the following criteria are satisfied, no further action to address potential landslide activation would be required:

- The area to be treated is in an area listed as “stable,” “few landslides,” or equivalent.

- The average slope steepness of the area to be treated is less than 10° (about 18%).
- There is no visible evidence of landslide activity (e.g., scarps, crooked trees, landslide generated debris piles) within the area to be treated, as documented by field reconnaissance.
- No habitable structures are within 100 feet of the toe of the slope downgradient of the area to be treated.

3. Subapplicants must determine on a case-by-case basis whether to retain a qualified professional (e.g., engineering geologist or geotechnical engineer) to conduct a geotechnical reconnaissance to evaluate the potential impacts of fuel reduction activities on future landslide potential if:

- A habitable structure is located within 100 feet of the toe of the slope downhill of the treatment area.
- The prescribed treatment would include the use of heavy equipment and significant ground disturbing activities (i.e., this requirement would not apply to methods such as hand treatment, weed-eating, or chemical treatment), and one or more of the following conditions is identified:
    - The treatment area is listed as “unstable” or “many landslides” on applicable slope stability mapping.
    - The average slope steepness of the treatment area is greater than 10° (about 18%).
    - There is visible evidence of landslide activity (e.g., scarps, crooked trees, and landslide generated debris piles) within the treatment area, as documented by a field reconnaissance.

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5.4 Water Resources

Surface water and groundwater quality can be adversely impacted by point and non-point sources of pollution. Non-point sources, which have been reported to be the leading cause of water quality impacts, are not easily discernible and can result from rain carrying various sources of pollution over or beneath the land until it is deposited, discharged, or leached to surface water and groundwater resources. Sources of non-point pollution can include herbicide application and excess sediment loading due to erosion (EPA 2012f). Most of the proposed action and all of the connected actions would occur in the region informally known as the East Bay Hills.

5.4.1 Surface Water

5.4.1.1 No Action Alternative

The no action alternative is described in Section 3.4.1.

5.4.1.1.1 Surface Water Quality Impacts Associated with Herbicide Application

Under this alternative conditions and fire management activities at lands managed or operated by the subapplicants would essentially remain unchanged from current conditions, and it is expected that water quality would remain unchanged.

UCB currently uses herbicides (glyphosate, triclopyr, and imazapyr) as part of its management strategy for fuel reduction areas (Klatt 2011b) and evaluates herbicide use under its 2020 Hill Area Fire Fuel Management Program.

The City of Oakland bans use of pesticides in the city with 11 exemptions including use in forestry management and use within the context of its integrated pest management (IPM) program. When pesticides are used under an exemption several restrictions are implemented, which include best management practices that guide the use of the herbicides and limit allowable herbicides to glyphosate and triclopyr. Imazapyr is not approved for use in Oakland.

EBRPD currently uses herbicides in vegetation management in accordance with its IPM program and best management practices, and tracks and analyzes annual pesticide usage in accordance with state and local requirements.

Increased use of herbicides would not be expected under the no action alternative and surface water quality would remain similar to existing conditions with respect to herbicides. Therefore, no adverse effects to surface water quality with respect to herbicides would be expected under the no action alternative.

5.4.1.1.2 Surface Water Quality Impacts Associated with Erosion and Sedimentation

Soil on ridgelines and on steep slopes has the greatest potential to erode and be carried over land and into streams and water bodies. Disturbance of soil and vegetation has the potential to increase erosion by exposing additional soil to wind and rain, which can carry it to waterways. Erosion potential can increase following a wildfire due to loss of vegetation, and erosion can lead to sedimentation and increased turbidity in streams and water bodies. Under the no action

alternative a major wildfire would be more likely, and the potential for erosion and sedimentation associated with wildfire would be greater.

Currently, each subapplicant has best management practices in place as part of vegetation management programs on lands they operate or manage. UCB has mitigation measures and strategies included as part of the 2020 Hill Area Fire Fuel Management Program to mitigate potential impacts to water quality from erosion and resulting sedimentation (UCB 2003). Mitigation measures include restriction of litter removal to the dry season and limiting the use of machinery to remove trees to areas with slopes of less than 30%. In addition, the 2020 Hill Area Fire Fuel Management Program proposes to leave a layer of chipped material in place as mulch following tree removal as one means to reduce exposed soil following implementation of the actions proposed by UCB (UCB 2003). Oakland has implemented the City of Oakland Municipal Code 13.16, the Creek Protection Ordinance, which is intended to reduce erosion and sedimentation in city creeks. To accomplish this objective, best management practices are required for construction or business activities that could impact surface water quality. EBRPD's Master Plan (EBRPD 2012d) identifies erosion as a key management issue for parklands because it can degrade water quality. The plan stresses vegetation maintenance, restoration using native species, and selection of construction and maintenance operations that reduce soil disturbance especially in areas with unstable soil. In the absence of wildfire, the potential for erosion and resulting sedimentation and turbidity in surface water would remain unchanged under the no action alternative.

Although the occurrence of wildfires cannot be predicted, a major wildfire would be more likely under the no action alternative. Water quality could be adversely affected immediately following a fire due to increased sedimentation and turbidity caused by loss of vegetative cover and ground litter. This is supported by the results of the U.S. Forest Service (USFS) Water Erosion Prediction Project (WEPP) fuel management tool (FuME) model described in Section 5.3.2.2.

5.4.1.2 Proposed and Connected Actions

The proposed and connected actions are described in Section 3.4.2.

5.4.1.2.1 Surface Water Quality Impacts Associated with Herbicide Application

Typically, a single application of liquid herbicide would be applied to each cut tree stump within 60 minutes of felling. A typical tree requires between 1 and 2 ounces of diluted solution, which must be applied to the cambium layer directly beneath the bark. Maintenance applications would occur infrequently subsequent to the initial application. Implementation of the best management practices (BMPs) described in Section 5.4.4 would prevent herbicides from reaching surface waters. In addition, within 60 feet of surface waters only Garlon 3A, an aquatic safe formulation, would be applied directly to stumps. Application would not occur within 24 hours of a rain event or a predicted rain event. Based on a review of the proposed herbicide application methods, the toxicity of the herbicides being considered for application, and the implementation of proposed best management practices and mitigation measures described in Section 5.4.4 below, no significant adverse effect to surface water quality would result from herbicide application compared to the no action alternative. This conclusion is supported by the analysis of potential effects of herbicide use on water quality in Appendix L.

5.4.1.2.2 Surface Water Quality Impacts Associated with Erosion and Sedimentation

Implementation of the proposed and connected actions would disturb surface soil resulting in soil erosion, increased sedimentation in nearby water bodies, and increased water turbidity at least for the short term. In contrast, in the long term, implementation of the proposed and connected actions could improve water quality by reducing the risk of catastrophic wildfires and the erosion that can result from loss of vegetative cover and ground litter during a fire.

Short-term erosion, sedimentation, and turbidity could occur in waterways in and downstream of the proposed and connected project areas from overland flow of rainwater over disturbed soil. The land can be disturbed during fuel reduction activities by cutting of vegetation on slopes and use of heavy machinery that can destabilize soils, and the resulting erosion could increase turbidity in surface water. The effect of turbidity on sensitive aquatic receptors like salmonids varies by life stage with juveniles generally subject to a greater number of factors than adults. Although low to moderate turbidity levels can provide cover from predation, high levels can reduce feeding efficiency of several types of aquatic receptors, limit food availability, and clog gillrakers of fish. Some mobile aquatic receptors, such as fish, can move out of turbid areas to some degree; however, less mobile or immobile receptors, such as benthic organisms, are unable to make that adaptation and are exposed to adverse conditions. In addition, long-term sedimentation can increase the occurrence and severity of localized flooding, negatively impacting water quality. To reduce potential short-term erosion to surface water from disturbed soil areas during implementation of the proposed and connected actions and to manage long-term erosion control prior to revegetation by native species, best management practices and mitigation strategies would be implemented, as described below.

In addition, each of the subapplicants would leave a layer of chipped material as mulch in place on approximately 20% of each project site, and would use logs and wood chips to create sediment traps in erosion-prone areas. Plant and litter material that remain on the ground under tree cover typically help with retention of rain water and reduce overland transport of rain water and soil to surface water bodies. The placement of chipped material as mulch can also provide these beneficial uses for the protection of surface water bodies. Hatchett et al. conducted research that, in part, evaluated the negative impacts of runoff in a forest in California following thinning of vegetation. One of the scenarios evaluated was retention of a mulch layer. The study simulated rainfall events to determine rainfall infiltration, runoff rates, and erosion rates. Simulated rainfall intensity rates were approximately 3 inches per hour. Mulching reduced the amount of bare soil, and no runoff occurred from the study area that had a wood chip layer and a slope up to 20% when rainfall was up to 2.9 inches an hour. When simulated rainfall was 4.7 inches per hour, runoff occurred, but was only 32% of that occurring when soil was exposed (Hatchett et al. 2006). This suggests that wood chips are an effective means for reducing runoff during implementation of the proposed and connected actions. The conclusions of the study also suggest that the proposed and connected actions and use of wood chips as mulch would reduce runoff and negative impacts to water quality when compared to the potential for large tracts of exposed soil following a catastrophic wildfire, should one occur.

ESA and Philip Williams and Associates (PWA) prepared a technical memorandum for UCB summarizing the results of the UC Berkeley Tree Removal Hydromodification Analysis (ESA PWA 2011), which was conducted in preparation for the fuel reduction management activities

evaluated in this EIS. The analysis was completed to evaluate the potential impacts or modifications to the watershed hydrology under different fuel reduction scenarios and identify best management practices to reduce the impacts. The evaluation was based on the Bay Area Hydrology Model, a continuous-simulation rainfall-runoff model designed, in this case, to estimate changes in runoff and infiltration rates due to soil disturbance and changes in evapotranspiration rates under three scenarios. One of the scenarios evaluated possible mitigation of these changes by leaving a layer of wood chips in place. The wood chips are expected to "substantially increase soil infiltration rates and precipitation interception, lower evapotranspiration rates, and increase surface roughness relative to the tree removal scenario." The evaluation concluded that tree removal has significant potential to alter watershed hydrology but leaving a layer of mulch chips in place can mitigate runoff (ESA PWA 2011). The conclusion of this evaluation further supports the conclusion that wood chips can alleviate sedimentation and subsequent impairment of water quality.

Eucalyptus leaves contain eucalyptus oil and other phytochemicals that are known to repel insects and inhibit weeds (allelopathy). Mary L. Duryea, assistant director of the Institute of Food and Agricultural Sciences at the University of Florida, has conducted research comparing several organic mulches, including eucalyptus. Duryea states that "our studies show that all fresh mulches had some allelopathic effects maybe for the first 3 months in the landscape." This suggests that allelopathic effects may occur where wood chips are left onsite, but such effects are likely to be relatively short lived (i.e., approximately 3 months) and discourages weeds, moderates soil temperatures, and promotes water conservation." Pine contains resins, which are leached from wood upon aging. Once aged, pine wood chips are considered nontoxic and acceptable as garden mulch. These findings suggest that short-term and localized effects on soil microbes, soil invertebrates, and terrestrial plant seedlings may result from exposure to fresh eucalyptus and possibly pine wood chips. Once aged, these chips are expected to be nonhazardous to soil associated organisms. The limited data described above, in conjunction with the benefits of using wood chips to minimize overland runoff to surface water bodies, as well as implementation of best management practices suggest that retention of wood chips would be beneficial in the long term to minimize erosion and associated negative impacts to water quality.

It is possible that a catastrophic wildfire could occur in the proposed and connected project areas. Implementation of the proposed vegetation management strategy is expected to reduce the severity of potential wildfires by removing vegetation that fuels and helps spread fires. Thus, implementation of the proposed and connected actions could reduce the potential for significant wildfires and resulting erosion, sedimentation and turbidity, as supported by the results of the USFS WEPP FuME model described in Section 5.3.2.2. Thus, the proposed and connected actions could lead to a beneficial effect on water quality by reducing the severity of a wildfire and the resulting erosion.

5.4.1.3 Avoidance and Mitigation Measures

Standard best management practices and mitigation measures would be implemented during operations to avoid and minimize adverse effects to water quality, especially with respect to

herbicide application and erosion, which can lead to sedimentation and increased turbidity. These include, but are not limited to, those presented in Section 5.4.4 (FEMA 2012a).

5.4.2 Groundwater

Surface water that flows over portions of the proposed and connected project areas with sandy or highly porous soil can percolate into the groundwater in recharge areas (UCB 2003). Potential impacts to groundwater are assessed below with respect to herbicide application and sedimentation under the proposed and connected actions and the no action alternative.

5.4.2.1 No Action Alternative

Under the no action alternative, vegetation management activities on lands managed or operated by the subapplicants would remain essentially unchanged from current conditions, and no change in groundwater quality would be expected. No adverse effects to groundwater quality would be expected under the no action alternative.

5.4.2.2 Proposed and Connected Actions

The pathways by which herbicides could contact groundwater are unchanged from those presented in the no action alternative. Similar to the no action alternative, groundwater impacts would only be expected if concentrations of herbicides were sufficiently elevated and large quantities were utilized. However, under the proposed and connected actions, a small volume (1 to 2 ounces of a diluted solution) is proposed for use at each tree by each of the subapplicants in accordance with local and state requirements and maintenance treatment occurs infrequently subsequent to the initial application. For example, past experience by EBRPD indicates that only about 5% of cut stumps survive to need re-treatment (Rasmussen 2013). Thus, only a very small proportion of stumps in a unit for this project might need to be treated during maintenance activities. Further, foliar spraying would not be used to convert shrub areas to grass, but might be used sparingly during maintenance to prevent regrowth. Additionally, as described in Appendix L, the physical and chemical characteristics of proposed herbicides (ex. persistence and mobility) support the conclusion that groundwater would not be adversely impacted. Finally, implementation of best management practices described above to protect surface water would also protect groundwater. Therefore, no adverse effects to groundwater quality with respect to herbicide application would be expected under the proposed and connected actions.

5.4.2.3 Avoidance and Mitigation Measures

The best management practices and mitigation strategies that would be implemented for the protection of surface water described in Section 5.4.4 also would be protective of groundwater.

5.4.3 Floodplains

Floodplains can be impacted by herbicide application if the chemical treatment occurs in the immediate vicinity and results in chemical runoff and deposition in floodplain soils or sediments. Additionally, downstream floodplains can also be impacted by herbicide application in upland areas if drift or runoff deposits herbicides or material impacted by herbicides (soil, sediment, foliage) in floodplains. Finally, if herbicides runoff to vegetation in floodplains and those plant types are susceptible to the effects of the selected herbicide, vegetation type, quality, and cover

can be altered. Floodplains are susceptible to flooding and changes in conditions can exacerbate flooding potential. Conditions that allow for erosion also allow for the potential for flooding and impacts to floodplains. Erosion can cause creek beds to become shallower, reducing the volume of water that can be retained during periods of heavy rain. Erosion and subsequent sedimentation can also increase the speed of flow of runoff to the creeks, making waterways unable to retain the increased volume of water in a reduced time frame. Removal of vegetation can increase the erosion and subsequent flooding potential, which can impact floodplains. Impacts to floodplains are assessed below with respect to herbicide application and sedimentation under the proposed and connected actions and the no action alternative.

5.4.3.1 No Action Alternative

5.4.3.1.1 Impacts Associated with Herbicide Application

Under this alternative vegetation management activities on lands owned by the subapplicants would remain essentially unchanged, and floodplain soil and sediment quality and vegetation type and cover should also remain unchanged. Best management practices are currently being implemented to reduce any adverse effects from herbicide application to downstream floodplains. Increased use of herbicides would not be expected under this alternative and floodplain conditions would remain similar to existing conditions with respect to herbicides. Therefore, no adverse effects to floodplains with respect to herbicides would be expected under the no action alternative.

5.4.3.1.2 Impacts Associated with Erosion and Sedimentation

The wildfire hazard reduction measures currently undertaken by the subapplicants include limited cutting of vegetation. Each subapplicant has implemented best management practices and mitigation measures to reduce the potential for erosion. Because of the small scale of vegetation reduction actions and the implementation of best management practices no adverse effect to floodplains occurs under current conditions. Under the no action alternative, current conditions would not change.

5.4.3.2 Proposed and Connected Actions

5.4.3.2.1 Impacts Associated with Herbicide Application

Of the 105 proposed and connected project areas, one is in a 100-year floodplain, two are within 300 feet of a 100-year floodplain, and 12 are between 0.13 and 0.35 mile from a 100-year floodplain (see Section 4.5.4). Under the proposed and connected actions herbicide use in or upgradient of floodplains could cause herbicides to be deposited in floodplains through airborne drift, runoff, erosion and sedimentation involving soils containing herbicides, or deposition of vegetation or other materials coated with herbicides in the floodplain. Additionally, if sufficient concentrations of herbicides run off to vegetation in floodplains and those plant types are susceptible to the effects of the selected herbicide, the vegetation could be adversely affected. Despite the increased use of herbicides proposed under the proposed and connected actions, implementation of the best management practices listed in Section 5.4.4.2 would mitigate potential adverse impacts. Based on review of the proposed herbicide application methods, the

toxicity of the herbicides being considered for application, and implementation of the proposed best management practices and mitigation measures, no significant adverse effect to floodplains would result from herbicide application compared to the no action alternative. This conclusion is supported by the analysis of potential effects of herbicide use on water quality in Appendix L.

5.4.3.2.2 Impacts Associated with Erosion and Sedimentation

Use of heavy equipment to cut and process trees and other vegetation during implementation of the proposed and connected actions would increase the amount of exposed soil in the project areas. Exposed soil tends to increase the rate of overland flow, which increases the volume of water carried to waterways. In addition, exposed soil can be carried by runoff into creek beds, reducing the capacity of the creek to retain excess water flow. Increased flow and decreased creek bed capacity can increase flooding. However, best management practices described above to mitigate erosion, such as deposition of chips and strategic placement of sediment traps would also be applicable for protection of floodplains. Further, revegetation of exposed soil would mitigate the potential long term effects associated with erosion and associated floodplain impacts. Implementation of best management practices would prevent short- and long-term adverse effects to floodplains under the proposed and connected actions.

5.4.3.3 Avoidance and Mitigation Measures

The best management practices and mitigation measures that would be implemented to minimize erosion, sedimentation, and increased turbidity, described in Section 5.4.4, would also mitigate impacts to floodplains. An increased risk of flooding as a result of the proposed and connected actions would only be possible as a result of increased sedimentation due to erosion, which would lead to decreased stream capacity. The best management practices minimize the risk that extensive erosion or sedimentation would occur. No proposed or connected actions would create a structure within a floodplain or otherwise physically impede water flow or decrease stream capacity.

5.4.4 Best Management Practices and Mitigation Measures

All rules, regulations, best practices and restrictions as imposed by the California Department of Pesticide Regulation (CDPR)[1] and other state and federal agencies would be followed during performance of this project. Standard best management practices and mitigation measures would be implemented during operations to avoid and minimize adverse effects to water quality, especially with respect to herbicide application and erosion, which can lead to sedimentation and increased turbidity. Unforeseen events that could impact water quality would be addressed in a Spill Prevention, Control & Countermeasure Plan (SPCC) that would be developed for this project.

These practices and measures include, but are not limited to, those presented below (FEMA 2012a).

5.4.4.1 General Best Management Practices and Mitigation Measures for Protection of Surface Water

- Avoiding crossing drainage areas with running or standing water with mechanical equipment while water is present.
- Complying with National Pollutant Discharge Elimination System (NPDES) stormwater permitting requirements and preparing Stormwater Pollution Prevention Plans (SWPPP), which address water quality testing, data analysis methods, and preventing and correcting accidents that could affect water quality, such as fuel spills.
- Using hand-fellers for trees within 50 feet of a drainage channel; these trees would be felled perpendicular to the ephemeral drainage and processing would be done by a skidder, if the skidder could safely handle stems at 50-foot distance from drainage, otherwise, the trees would be lopped and scattered by hand fellers.
- Locating landings to accommodate skidding distances of up to 1,000 feet; for landings near streams, residue piles, i.e., sawdust, field chipping, residue, etc., would be placed away from drainages where runoff could wash residue into streams or wetlands.
- Avoiding skidding across dry or running streams; when that is not possible, temporary crossings would be used during the dry season while ephemeral creeks are dry.
- Avoiding operating mechanical equipment within the stream buffer zone and where such impact is unavoidable, employing standard best management practices to mitigate disturbance.

5.4.4.2 Herbicide Application Best Management Practices and Mitigation Measures

All rules, regulations, best practices and restrictions as imposed by the CDPR[1] and other state and federal agencies would be followed during herbicide application. In addition, all instructions, restrictions, use limitations and disposal/spill remediation methods described on each herbicide label must be followed. Also to be implemented, where applicable, are the specific restrictions imposed by the injunction issued on October 20, 2006 by the U.S. District Court for the Northern District of California for the protection of the California red-legged frog (CRLF) and associated habitats.

Further restrictions proposed by subapplicants include (FEMA 2012a):

- Stump application of all herbicides (e.g., Garlon 4 Ultra, RoundUp, Stalker, or Garlon 3A) would be conducted by a State of California Qualified Applicator or by staff under their supervision.
- Contractors must have all necessary licensing by CDPR for herbicide application. Use of herbicides must be consistent with label instructions and material safety data sheets documents must be maintained.

[1] http://www.cdpr.ca.gov/

- Herbicides would not be applied directly to water or within 24 hours of expected rainfall (40% chance of rain or greater).
- IPM Approaches: Subapplicant would also use non-chemical methods such as hand pulling or chip deposition on seed stock to prevent seedling germination, thus reducing the need for herbicides.
- A single application of liquid herbicide would be applied to each cut tree stump within 60 minutes of felling; a typical tree requires 1 to 2 ounces of diluted solution, which must be applied to the cambium layer, directly beneath the bark. The cut stump formulation may be diluted or adjusted when, at the judgment of the project manager, the rate of material used may exceed the amount allowable per acre per year, by EPA regulations.
- Drift from foliar application would be minimized by avoiding days with winds greater than 10 mph, using proper spraying techniques, and following all CDPR regulations. Herbicide would only be applied by hand during dry weather and a back sprayer would be used to selectively apply herbicide to the young foliage of resprouted eucalyptus and acacia, or other invasive species such as broom, coyote brush, or poison oak.
- Herbicide applications would be rotated for best impact during the growing season. The lowest effective concentration needed for effectiveness would be used, typically specified as a range on the product label. Note that concentration is dependent on method of application: cut stump mixtures are more highly concentrated than foliar mixtures.
- Restrictions on foliar use during periods in which the winds exceed 10 miles per hour or are less than 2 miles per hour at ground level would be observed.
- No herbicides would be intentionally applied to nontarget species.
- All containers would be labeled according to CDPR regulations.
- All containers would be disposed of according to CDPR regulations.
- All materials would be stored according to CDPR regulations.
- All materials use would be recorded and reported per CDPR regulations.
- Because the restrictions on use are so numerous and species/application dependent, the label instructions or CDPR website would be consulted for a complete (and evolving) set of use guidelines and restrictions.
- Best management practices would be implemented to prevent transport of herbicides to surface water bodies via runoff or drift. These include a 60 foot buffer zone adjacent to ephemeral or permanent surface water bodies. Within 60 feet of standing or flowing water, direct stump application of herbicides could occur, but only using Garlon 3A or other herbicides approved for use near water. Foliar application would not be used in the buffer or in other areas subject to potential drift to surface water bodies. The recommended 60-foot no-use zone is based on information obtained from the website http://www.cdpr.ca.gov/docs/endspec/rl_frog/index.htm. This no-use zone was imposed over certain areas by the U.S. District Court for the Northern District of California. Some of these no-use zones intersect with the project area and are intended for the protection of CRLF. CRLF habitat may occur throughout the project area and, therefore, it is reasonable to apply similar conditions on herbicide application throughout the project

area. The implementation of the 60-foot no-use zone required for protection of CRLF is assumed to be adequately protective of all aquatic receptors that may occur in project area surface waters, including special status species (e.g., salmonid fish) and aquatic prey items important for the survival of special status species (FEMA 2012a). This is described further in Appendix L.

- Unless more stringent application restrictions apply, treatments occurring within or under the jurisdiction of Oakland would be consistent with the City of Oakland Creek Ordinance. Based on this ordinance, trees within 50 feet of watercourses would be cut by hand felling only; no mechanized equipment is intended to be used for either removal or mastication in this 50-foot buffer. If feasible, heavy machinery may be used to endline material out of the buffer area, as long as the machinery itself does not enter or drive inside the buffer zone. Oakland would implement chemical applications per the CDPR pesticide guidance adjacent to water features. Within the stream buffer, cut stump application of approved herbicides would be applied within 60 minutes of felling. The areas chemically treated would include areas up to the ordinary high water mark of ephemeral streams; however, no stumps would be treated within 60 feet of running or standing water or within 24 hours of a rain event.

5.4.4.3 Best Management Practices and Mitigation Measures for Erosion, Sedimentation, and Increased Turbidity

- The subapplicant would use existing strategic fire roads to the maximum extent possible. However, some temporary access routes and skid trails would be needed, and which would be anticipated to return to existing conditions within 1 year. New skid trails would be on firm, well-drained soils and grades would typically be less than 15%. Where steep grades are unavoidable, grade breaking techniques and soil-stabilization practices would be implemented. Temporary access routes may be constructed to extract downed materials.
- Each area would be inspected for evidence of severe erosion as a result of vegetation management. If severe erosion is occurring at a site, only native plant seeds or stock shall be used for erosion control, unless otherwise approved by USFWS. If necessary, fencing, signs, maintenance, access control, jute fabric, sediment traps, mulch, straw wattles (without plastic monofilament netting), vegetation management, exotic species control, or any other commonly used erosion control technique may be used to promote the ecological health of the sites.
- Taking all necessary safeguards to prevent sedimentation into watercourses during all phases of the vegetation management work.
- Best management practices, as identified by the Regional Water Quality Control Board (RWQCB) would be implemented to control erosion during and after vegetation removal. Erosion control best management practices would include, but are not limited to:
  - Leaving tree stumps and/or root systems in place until vegetation becomes re-established in logged areas.
  - Installing storm drain protection prior to vegetation management for areas near storm drains.

- Placing a deep bed of chips around tree stumps to allow mechanical skidders to travel above the chip bed, as needed. Chips may be unnecessary around stumps located outside of the skidder routes.
- Using chipped biomass and whole tree trunks retained behind stumps to create sediment traps roughly following the slope contours.
- Avoiding operation of heavy equipment on slopes steeper than 35% and develop specific measures to minimize effects of erosion if such areas are unavoidable.
- Stabilizing all construction entrances and exits to control erosion and sediment discharges from the sites.
- Cleaning and maintaining streets and roads in such a manner as to prevent unauthorized non-stormwater discharges from reaching surface water or MS4 drainage systems.
- Selecting mechanical treatments according to an area's topography, access, vegetation type and potential for environmental impacts.

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5.5 Air Quality

This section summarizes the air quality impact analysis that was conducted and provides the action-related air emission results. The analysis was conducted following the general methodology described below. Emissions of criteria pollutants are presented for the proposed and connected actions and the no action alternative.

Standard emission estimation models approved by the California Air Resources Board (CARB) and EPA were used to estimate emissions from initial implementation of the proposed and connected actions. The bulk of the implementation emissions would be primarily from logging equipment used in fuel reduction activities and from prescribed burning. In addition, several sites would require construction or repair of access roads; therefore, construction equipment emissions from road building were included for these sites. The factors for equipment, dust, and burning were used with estimated activity levels, such as number of pieces of equipment, number of days of active operation, disturbed acreage, and vehicle miles traveled to determine total and annual emissions of criteria air pollutants. It should be noted that the emission estimates are conservative – material is assumed to be either burned or removed by truck from a given site. No attempt was made to quantify the material that would be left on a site unburned.

In general, the fuel reduction activity emissions were estimated using appropriate emission factor models and spreadsheet calculations. CARB's latest on-road vehicle emission factor model, EMFAC2011 (CARB 2011) was used to estimate on-road vehicle emissions from worker automobile travel to and from the work sites, as well as from heavy-duty diesel trucks used to haul wood, chips or material to or from the sites. The latest CARB off-road equipment emissions model, OFFROAD 2007 (CARB 2006) was used to estimate off-road mobile equipment (feller/bunchers, skidders, chainsaws, air compressors, etc.) emissions. Emission factors from EPA AP 42 guidelines were used to estimate fugitive emissions from entrained road dust and prescribed burning.

The following construction sources and activities were analyzed for emissions:

- Onsite access road construction equipment emissions and fugitive dust (CARB 2006, CARB 2011, Midwest Research Institute [MRI] 1996)
- Onsite logging and debris removal equipment (CARB 2006)
- Offsite haul truck engine emissions (CARB 2011)
- Offsite worker vehicle trips to and from the sites (CARB 2011)
- Entrained fugitive dust emissions for paved and unpaved road travel (EPA 2011c)
- Prescribed burning (EPA 1996).

The equipment and activity specific emission factors are presented in Table 5.5-1 for on-road vehicle travel. For paved and unpaved road emissions the vehicle engine exhaust emissions from EMFAC2011 (CARB 2011) have been added to paved and unpaved road dust emissions factors obtained from EPA's AP-42 emission factor estimates.

Table 5.5-1. On-Road Vehicle Emission Factors

Trip Type	VMT/ Trip[1]	No. of Trips[2]	VMT/ day	VOC (lbs/day)[3]	CO (lbs/day)	NOx (lbs/day)	PM-10 (lbs/day)[4]	PM-2.5 (lbs/day)[5]	SO_2 (lbs/day)
Worker Trips[6]	30	2	60	0.030	0.316	0.032	0.023	0.007	0.001
Worker Trips[7]	1	2	2	0.009	0.068	0.005	0.527	0.053	0.000
Dump Truck Trips[6]	40	2	80	0.089	0.405	2.204	0.434	0.148	0.003
Dump Truck Trips[7]	1	2	2	0.010	0.044	0.117	1.784	0.180	0.000
Water Truck[6]	20	2	40	0.048	0.219	1.134	0.217	0.074	0.002
Water Truck[7]	1	2	2	0.010	0.044	0.117	1.784	0.180	0.000
Log/Chip Haul Truck Trips[6]	75	2	150	0.230	1.037	4.137	0.849	0.311	0.006
Log/Chip Haul Truck Trips[7]	1	2	2	0.011	0.049	0.118	1.784	0.181	0.000
Firewood Haul Truck Trips[6]	40	2	80	0.126	0.570	2.236	0.453	0.166	0.003
Firewood Haul Truck Trips[7]	1	2	2	0.011	0.049	0.118	1.784	0.181	0.000

Sources: EPA 2011c and EPA 2006.
VMT = Vehicle miles traveled
VOC = volatile organic compounds
CO = carbon monoxide
NOx = nitrogen oxides
PM-10 = particulate matter less than 10 micrometers
PM-2.5 = particulate matter less than 2.5 micrometers
SO_2 = sulfur dioxide
Notes:
(1) Distance based on one-way trips.
(2) Two one-way trips = one round trip, emissions are for a round trip.
(3) Does not include diurnal losses - not applicable to project impacts.
(4) Includes paved road dust of 0.129 g/VMT for cars and 2.04 g/VMT for trucks (EPA 2011c); and unpaved road dust of 119 g/VMT for cars and 404 g/VMT for trucks (EPA 2006).
(5) Includes paved road dust of 0.032 g/VMT for cars and 0.510 g/VMT for trucks (EPA 2011c); and unpaved road dust of 12 g/VMT for cars and 40 g/VMT for trucks (EPA 2006).
(6) For travel on paved roads. Silt loading = 0.06 g/m2; vehicle weight = 2 tons for worker vehicles and 30 tons for all trucks.
(7) For travel on unpaved (access) roads. Silt content = 8.4%, vehicle weight = 2 tons for worker vehicles and 30 tons for all trucks.

The paved road dust emission factors were determined using Equation 5.5-1 (EPA 2011c):

$$E_{ext} = [\ k\ (sL)^{0.91}\ (W)^{1.02}\ ]\ (1 - P/4N) \qquad (5.5\text{-}1)$$

where: E = particulate emission factor (grams per vehicle mile traveled, g/VMT),

k = particle size multiplier for particle size range of interest (1.0 for PM-10; 0.25 for PM-2.5),

sL = road surface silt loading (grams per square meter, 0.06 g/m^2 for roads with 5,000 to 10,000 average daily trips),

W = average weight (tons) of the vehicles traveling the road (2 tons for worker trips, 30 tons for all trucks),

P = number of "wet" days with at least 0.01 inch of precipitation during the averaging period, and

N = number of days in the averaging period (365 for annual).

The unpaved road dust emission factor was determined using Equation 5.5-2 (EPA 2006):

$$E_{ext} = [\ k\ (S/12)^a\ (W/3)^b\ ]\ [(365 - P)/365] \qquad (5.5\text{-}2)$$

where: E = particulate emission factor (pounds per vehicle mile traveled, lbs/VMT),

k = particle size multiplier for particle size range of interest (1.5 for PM-10; 0.15 for PM-2.5),

sL = road surface silt content (percent, 8.4% for unpaved access roads),

W = average weight (tons) of the vehicles traveling the road (2 tons for worker trips, 30 tons for all trucks),

a = empirical constant (0.9 for PM-10 and PM-2.5),

b = empirical constant (0.45 for PM-10 and PM-2.5), and

P = number of "wet" days with at least 0.01 inch of precipitation during the averaging period.

Based on the project description, the haul truck trips were estimated assuming one trip per day with the number of haul days based on the percentage of removed vegetative material that would not be burned. It was assumed that 1 daily truck trip was needed for every acre of treated area (note that this is not the total acreage for each site, only the treated acreage). Truck travel distances for removal of wood and debris assumed that the material would be hauled to a commercial cogeneration facility near Woodland, California. It was also assumed that trimming and logging activity would last approximately 5 days for every acre of treated area; this assumption was used to estimate the number of days that workers drove to each site.

Table 5.5-2 presents the emission factors for off-road construction equipment engines. Most types of logging equipment potentially used on this action could be found in the OFFROAD2007 (CARB 2006) model. However, masticators were not explicitly identified; therefore, it was assumed the masticator unit would be mounted on a skid-steer loader. Fugitive dust from access road construction was estimated using the general construction site emission factor of 0.11 tons per acre per month of activity (MRI 1996). This value assumes the site would be watered at least twice per day during access road construction.

Table 5.5-2. Off-Road Equipment Emission Factors

Equipment	Fuel[(1)]	Max HP	Fuel Used gal/day per unit	Engine Exhaust Emission Rates, lbs/day/unit				
				VOC	CO	NOx	SO_2	PM[(2)]
Air Compressors	G4	15	0.4644	0.073	2.684	0.054	0.000	0.037
Chainsaws	G2	2	0.0662	0.111	0.200	0.002	0.000	0.000
Chainsaws Preempt	G2	15	0.1599	0.268	0.484	0.004	0.000	0.001
Chippers/Stump Grinders-Trailer	G4	25	6.9405	1.124	41.59	0.719	0.002	0.539
Chippers/Stump Grinders	D	500	14.0392	0.177	0.686	2.141	0.003	0.066
Dozers (Crawler Tractors)	D	120	9.9476	0.426	1.599	2.530	0.003	0.223
Fellers/Bunchers	D	250	35.4280	0.472	1.516	4.544	0.009	0.144

Table 5.5-2. Off-Road Equipment Emission Factors

Equipment	Fuel[1]	Max HP	Fuel Used gal/day per unit	Engine Exhaust Emission Rates, lbs/day/unit				
				VOC	CO	NOx	SO_2	PM[2]
Loaders, Rubber Tired	D	120	8.2812	0.298	1.273	1.845	0.002	0.161
Loaders, Skid Steer	D	50	3.1371	0.138	0.604	0.609	0.001	0.042
Mowers, Rear Engine Riding	G4	15	0.3446	0.032	2.010	0.023	0.000	0.002
Skidders	D	175	28.9688	0.519	3.653	4.116	0.007	0.229
Trimmers/Edgers/Brush Cutters	G2	2	0.0206	0.022	0.073	0.001	0.000	0.000
Trimmers/Edgers/Brush Cutters	G4	5	0.0160	0.004	0.073	0.002	0.000	0.000

Source: CARB 2006

(1) Fuel type designations:

G2 = Gasoline for 2-stroke engines (such as chainsaw engines)

G4 = Gasoline for 4-stroke engines (such as automobile and large equipment engines)

D = Diesel for all diesel fueled engines

(2) PM emissions assumed to be the same for PM-10 and PM-2.5.

To estimate the off-road equipment emissions, OFFROAD2007 was run to generate statewide daily emissions (tons/day) in 2013 for each equipment type listed above in Table 5.5-2. These emissions were (i) divided by the statewide population for each equipment type and (ii) multiplied by 2000 pounds per ton to convert the emissions into pounds per day per piece of equipment (lbs/day/unit). These emission factors were multiplied by estimated durations for each activity on each site. As noted above in the discussion of on-road emission estimates, it was assumed that trimming and logging activity would last approximately 5 days for every acre of treated area. The equipment count used on each site was estimated by inspection of the treated acreage.

To estimate dust emissions for access road construction the 0.11 ton/acre/month emission factor noted above was (i) multiplied by 2000 lbs per ton, (ii) multiplied by a disturbed acreage estimate for road construction, and (iii) divided by 22 working days per month to obtain the emissions in lbs/day. Based on the longest access road distance, the disturbed acreage for road construction was estimated to be 0.25 acre.

The emission factors for prescribed burning are presented in Table 5.5-3. The quantity of material available on a site was based on the treated acreage of each vegetation type identified on each site. The difference between existing acreage and goal acreage for a given vegetation type was used to estimate the mass of vegetation removed, with the bulk of removed vegetation being eucalyptus/acacia, conifers, and various scrub species. In most sites, oak/bay and redwood woodlands, as well as grasslands, are to be preserved or expanded. In addition to the acreages removed from a given vegetation type in an area (e.g., 50% of the eucalyptus trees in AC001) it was also assumed that 5% of the preserved woody vegetation (e.g., oak/bay) would be removed when the lower branches were pruned. From the project description for each site the quantity of removed vegetation that would be burned was determined. Finally, it was estimated that for prescribed burning, 90% of the material would be pile burned and 10% would be broadcast burned (EBRPD 2013).

Equation 5.5-3 provides the general calculation used in determining total emissions from prescribed burning. The resulting emissions by vegetation type and site are first summed across all vegetation types that are burned on a given site and then summed across all sites.

Table 5.5-3. Prescribed Burn Emission Factors

Fuel Type	Estimated Average Fuel Loading, kg/acre	Pollutant Emission Factors, g/kg fuel[(1)]					
		CO	VOC	NOx	SO_2	PM-10	PM-2.5
Eucalyptus/Acacia	23,743 [(2)]	112	6.4	2.5	NA	12	11
Oak/Bay	7,799 [(3)]	112	6.4	2.5	NA	12	11
Pine	17,396 [(3)]	175	4.2	2.5	NA	13	13
Piled (Mixed)	5,693 [(3)]	37	NA	4	NA	4	4
Scrub	5,055 [(3)]	103	6.9	4	NA	15	13
Chaparral	11,433 [(3)]	101	12.5	4	NA	11	10
Grass	591 [(3)]	75	0	1	NA	10	10

Sources:
[(1)] EPA 1996
[(2)] Fuel loading for eucalyptus is an average of values from Agee, et al. 1973 and NPS 2006.
[(3)] Fuel loadings are averages from Clinton, et al. 2006; NPS 2006; and Russell and McBride 2003.

$$E_{i,j} = \{(L_i)\ (A_{i,j})\ (Frac_{burn,j})\ [(EF_{pile})\ (Frac_{pile})+(EF_{broad,i})\ (Frac_{broad})]\}/454 \qquad (5.5\text{-}3)$$

where: $E_{i,j}$ = total emissions from burning vegetation type i on site j (lbs),
L_i = fuel loading of vegetation type i (kg/acre),
$A_{i,j}$ = treated area of vegetation type i on site j (acres),
$Frac_{burn,j}$ = fraction of treated area on site j that would be burned,
EF_{pile} = emission factor for pile burning (g/kg fuel),
$EF_{broad,i}$ = emission factor for broadcast burning vegetation type i (g/kg fuel),
$Frac_{pile}$ = fraction of material that is piled burned = 0.90,
$Frac_{broad}$ = fraction of material that is broadcast burned = 0.10, and
454 = conversion factor (grams/lb).

Finally, it is anticipated that many of the sites would include treatment by chipping or pruning woody material and leaving it on site to naturally decay. The half life[1] for this material is typically 8 years to over 40 years (DOE 2007). Since the material is being spread and is not being stored in large stockpiles, the decomposition would generally be aerobic (oxygen would be present). This type of decay would produce some emissions of carbon dioxide (CO_2), a greenhouse gas, but not measurable quantities of other criteria or hazardous air pollutants (Lee et al. 2010). Additional discussion of CO_2 emissions from wood decay is provided in Section 5.6.

1 The half life of decaying wood is the time it takes one-half of the material to decay and no longer be part of the original wood.

Detailed schedules for identifying when each site would be treated have not been developed yet. The overall program is estimated to last approximately 10 years. Therefore, the total emissions calculated for the proposed and connected actions have been divided by 10 to estimate annual emissions for comparison to the General Conformity *de minimis* thresholds included in Section 4.6, Table 4.6-4. This should provide a reasonable estimate since not all sites would be treated in the same year. The estimated total and annual emissions are presented below for the proposed and connected actions as well as for the no action alternative.

5.5.1 No Action Alternative

The description of the no action alternative indicates that only ongoing fuel removal following existing practices would be conducted. The acreage and volume of vegetation removed under this alternative would be substantially less than with the proposed and connected actions. In addition, it was assumed that no prescribed burning would be part of the no action alternative, and no access roads would be constructed. It was also assumed that none of the connected actions would be implemented under the no action alternative. Criteria pollutant emissions for the no action alternative, by project area, are presented in Table 5.5-4. Detailed emission summaries for each project area are presented in Appendix D.

Table 5.5-4. No Action Alternative Total Emissions by Project Area

	Total Emissions (tons)					
Project Area	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**PM-2.5**
UCB-Claremont-PDM	0.07	0.02	0.14	0.00	0.02	0.01
UCB-Strawberry Canyon-PDM	0.10	0.03	0.18	0.00	0.03	0.01
UCB-Frowning Ridge-PDM	0.15	0.04	0.27	0.00	0.04	0.02
Oakland - North Hills-Skyline-PDM	0.07	0.02	0.13	0.00	0.02	0.01
Oakland - Caldecott Tunnel-PDM	0.06	0.02	0.11	0.00	0.02	0.01
EBRPD - Anthony Chabot Regional Park	0.41	0.07	0.48	0.00	0.07	0.03
EBRPD - Claremont Canyon Regional Preserve	0.06	0.01	0.07	0.00	0.01	0.00
EBRPD - Huckleberry Botanic Regional Preserve	0.02	0.01	0.02	0.00	0.00	0.00
EBRPD - Lake Chabot Regional Park	0.01	0.00	0.01	0.00	0.00	0.00
EBRPD - Leona Canyon Regional Open Space Preserve	0.01	0.00	0.01	0.00	0.00	0.00
EBRPD - Miller/Knox Regional Shoreline	0.02	0.01	0.03	0.00	0.00	0.00
EBRPD - Redwood Regional Park	0.09	0.02	0.15	0.00	0.02	0.01
EBRPD - Sibley Volcanic Regional Preserve	0.07	0.02	0.12	0.00	0.02	0.01
EBRPD - Sobrante Ridge Regional Preserve	0.01	0.00	0.01	0.00	0.00	0.00
EBRPD - Tilden Regional Park	0.22	0.05	0.39	0.00	0.06	0.02
EBRPD - Wildcat Canyon Regional Park	0.09	0.02	0.11	0.00	0.03	0.01
No Action Totals	**1.44**	**0.34**	**2.22**	**0.00**	**0.35**	**0.14**

The emissions estimates for the no action alternative in Table 5.5-4 and Appendix D do not include emissions from a wildfire. A major wildfire would be more likely under the no action

alternative. The 1991 Oakland Tunnel Fire burned 1,500 acres. Under the proposed and connected actions, EBRPD would cut a portion of the vegetation on 1,600 acres and would burn a portion of the cut vegetation. Another fire similar to the 1991 fire would generate a greater quantity of air emissions, and in higher concentrations, than the prescribed burning planned by EBRPD.

The emissions from the no action alternative in the absence of a wildfire are well below the significance thresholds listed in Section 4.6. Under NEPA, impacts of each action alternative are typically measured against the impacts of the no action alternative. That is, the no action emissions would be deducted from the proposed and connected actions before comparing those alternative emissions to the significance thresholds. However, the no action emissions are negligible; therefore, the evaluation of the proposed and connected actions does not deduct the no action emissions when determining significance.

5.5.2 Proposed and Connected Actions

Criteria pollutant emissions for the proposed action, by project area, are presented in Table 5.5-5. The additional emissions associated with the connected actions are presented in Table 5.5-6, and the combined proposed and connected action emissions, by project area, are presented in Table 5.5-7. Detailed emission summaries for each project area are presented in Appendix D.

Table 5.5-5. Proposed Action Total Emissions by Project Area

	Total Emissions (tons)					
Project Area	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**PM-2.5**
UCB-Claremont-PDM	1.13	0.19	1.23	0.00	0.42	0.09
UCB-Strawberry Canyon-PDM	1.30	0.22	1.43	0.00	0.46	0.10
UCB-Frowning Ridge-PDM	2.60	0.43	2.80	0.01	0.90	0.20
Oakland - North Hills-Skyline-PDM	1.21	0.20	1.31	0.00	0.42	0.09
Oakland - Caldecott Tunnel-PDM	0.95	0.16	1.03	0.00	0.33	0.07
EBRPD - Anthony Chabot Regional Park	25.66	3.69	6.15	0.01	3.59	2.45
EBRPD - Claremont Canyon Regional Preserve	3.92	0.51	0.61	0.00	0.48	0.35
EBRPD - Huckleberry Botanic Regional Preserve	2.68	0.53	0.24	0.00	0.28	0.25
EBRPD - Lake Chabot Regional Park	0.07	0.01	0.01	0.00	0.01	0.01
EBRPD - Leona Canyon Regional Open Space Preserve	0.82	0.08	0.05	0.00	0.07	0.05
EBRPD - Miller/Knox Regional Shoreline	5.96	0.62	0.78	0.00	0.62	0.50
EBRPD - Redwood Regional Park	7.55	0.88	1.19	0.00	0.91	0.72
EBRPD - Sibley Volcanic Regional Preserve	7.50	0.76	1.05	0.00	0.85	0.68
EBRPD - Sobrante Ridge Regional Preserve	0.35	0.06	0.02	0.00	0.03	0.02
EBRPD - Tilden Regional Park	19.71	2.56	3.41	0.00	2.45	1.95
EBRPD - Wildcat Canyon Regional Park	6.62	0.70	0.58	0.00	0.66	0.46
Proposed Action Totals	**88.03**	**11.60**	**21.88**	**0.03**	**12.46**	**8.00**

Table 5.5-6. Connected Actions Total Emissions by Project Area

	Total Emissions (tons)					
Project Area	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**PM-2.5**
EBRPD - Anthony Chabot Regional Park	84.19	12.02	15.92	0.02	10.82	8.45
EBRPD - Claremont Canyon Regional Preserve	20.12	2.12	1.31	0.00	1.87	1.41
EBRPD - Huckleberry Botanic Regional Preserve	0.07	0.01	0.00	0.00	0.01	0.01
EBRPD - Redwood Regional Park	19.00	1.79	1.68	0.00	1.86	1.56
EBRPD - Sibley Volcanic Regional Preserve	22.62	3.26	4.29	0.00	2.95	2.30
EBRPD - Tilden Regional Park	26.40	3.71	3.97	0.00	3.21	2.65
EBRPD - Wildcat Canyon Regional Park	10.05	1.38	1.51	0.00	1.21	1.02
Connected Action Totals	**182.45**	**24.28**	**28.67**	**0.03**	**21.93**	**17.40**

Table 5.5-7. Proposed and Connected Actions Total Emissions by Project Area

	Total Emissions (tons)					
Project Area	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**PM-2.5**
UCB-Claremont-PDM	1.13	0.19	1.23	0.00	0.42	0.09
UCB-Strawberry Canyon-PDM	1.30	0.22	1.43	0.00	0.46	0.10
UCB-Frowning Ridge-PDM	2.60	0.43	2.80	0.01	0.90	0.20
Oakland - North Hills-Skyline-PDM	1.21	0.20	1.31	0.00	0.42	0.09
Oakland - Caldecott Tunnel-PDM	0.95	0.16	1.03	0.00	0.33	0.07
EBRPD - Anthony Chabot Regional Park	109.84	15.72	22.06	0.03	14.41	10.90
EBRPD - Claremont Canyon Regional Preserve	24.04	2.63	1.92	0.00	2.35	1.76
EBRPD - Huckleberry Botanic Regional Preserve	2.75	0.54	0.24	0.00	0.28	0.25
EBRPD - Lake Chabot Regional Park	0.07	0.01	0.01	0.00	0.01	0.01
EBRPD - Leona Canyon Regional Open Space Preserve	0.82	0.08	0.05	0.00	0.07	0.05
EBRPD - Miller/Knox Regional Shoreline	5.96	0.62	0.78	0.00	0.62	0.50
EBRPD - Redwood Regional Park	26.56	2.67	2.86	0.00	2.77	2.28
EBRPD - Sibley Volcanic Regional Preserve	30.12	4.02	5.34	0.01	3.80	2.98
EBRPD - Sobrante Ridge Regional Preserve	0.35	0.06	0.02	0.00	0.03	0.02
EBRPD - Tilden Regional Park	46.11	6.27	7.38	0.01	5.66	4.60
EBRPD - Wildcat Canyon Regional Park	16.67	2.08	2.08	0.00	1.87	1.48
Combined Proposed and Connected Action Totals	**270.48**	**35.88**	**50.54**	**0.06**	**34.39**	**25.40**

Table 5.5-8 summarizes the emissions by source type. Off-road equipment include the logging, mulching, and chipping equipment used to reduce fuel and the construction equipment used to construct access roads on several of the sites. On-road vehicles include the worker trips to and from the sites, haul trucks removing wood or chips from the sites, and dump trucks or water trucks used in access road construction. The on-road emissions also include re-suspended road dust from vehicle travel on paved and unpaved roadways. Construction dust is associated with

the access road construction. Prescribed burning represents the emissions from combustion of trees, limbs, and brush that could be piled, burned, or broadcast burned on certain sites.

Table 5.5-8. Proposed and Connected Actions Total Emissions by Source Type

	Total Emissions (tons)					
Source Category	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**PM-2.5**
Proposed Action						
Offroad Equipment	21.58	2.53	15.30	0.03	0.81	0.74
Onroad Vehicles	3.15	0.34	1.13	0.01	4.76	0.56
Construction Dust	0.00	0.00	0.00	0.00	0.03	0.00
Prescribed Burning	63.30	8.72	5.44	0.00	6.86	6.70
Proposed Action Totals	**88.03**	**11.60**	**21.88**	**0.03**	**12.46**	**8.00**
Connected Actions						
Offroad Equipment	26.41	2.65	14.64	0.03	0.83	0.76
Onroad Vehicles	3.15	0.33	0.89	0.00	4.66	0.54
Construction Dust	0.00	0.00	0.00	0.00	0.00	0.00
Prescribed Burning	152.89	21.29	13.14	0.00	16.44	16.10
Connected Action Totals	**182.45**	**24.28**	**28.67**	**0.03**	**21.93**	**17.40**
Combined Proposed and Connected Action Totals	**270.48**	**35.88**	**50.54**	**0.06**	**34.39**	**25.40**

Comparing the emissions from each source type it is apparent that burning activities in the proposed and connected actions would be the major contributors to most criteria pollutant emissions. Burning represents 72% of CO emissions, 75% of VOC emissions, 25% of NOx emissions, 55% of PM-10 emissions, and 84% of PM-2.5 emissions for the proposed action. For the connected actions burning represents 84% of CO emissions, 88% of VOC emissions, 46% of NOx emissions, 75% of PM-10 emissions, and 93% of PM-2.5 emissions. The other notable emissions come from off-road equipment representing 70% and 51% of total NOx emissions from the proposed and connected actions, respectively; and paved road dust representing 38% and 21% of total PM-10 emissions from the proposed and connected actions, respectively.

Tables 5.5-5 through 5.5-8 above provide the total emissions that would be expected to occur over the duration of the project. As noted at the beginning of Section 5.5 it was assumed that these emissions would occur over a 10-year period. The estimated annual emission rates for the proposed and connected actions (combined) are summarized in Table 5.5-9.

Table 5.5-9. Combined Proposed and Connected Actions Annual Emissions by Project Area

	Annual Emissions (tons/year)					
Project Area	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**PM-2.5**
UCB-Claremont-PDM	0.11	0.02	0.12	0.00	0.04	0.01
UCB-Strawberry Canyon-PDM	0.13	0.02	0.14	0.00	0.05	0.01
UCB-Frowning Ridge-PDM	0.26	0.04	0.28	0.00	0.09	0.02
Oakland - North Hills-Skyline-PDM	0.12	0.02	0.13	0.00	0.04	0.01
Oakland - Caldecott Tunnel-PDM	0.10	0.02	0.10	0.00	0.03	0.01
EBRPD - Anthony Chabot Regional Park	10.98	1.57	2.21	0.00	1.44	1.09
EBRPD - Claremont Canyon Regional Preserve	2.40	0.26	0.19	0.00	0.24	0.18
EBRPD - Huckleberry Botanic Regional Preserve	0.28	0.05	0.02	0.00	0.03	0.03
EBRPD - Lake Chabot Regional Park	0.01	0.00	0.00	0.00	0.00	0.00
EBRPD - Leona Canyon Regional Open Space Preserve	0.08	0.01	0.00	0.00	0.01	0.01
EBRPD - Miller/Knox Regional Shoreline	0.60	0.06	0.08	0.00	0.06	0.05
EBRPD - Redwood Regional Park	2.66	0.27	0.29	0.00	0.28	0.23
EBRPD - Sibley Volcanic Regional Preserve	3.01	0.40	0.53	0.00	0.38	0.30
EBRPD - Sobrante Ridge Regional Preserve	0.03	0.01	0.00	0.00	0.00	0.00
EBRPD - Tilden Regional Park	4.61	0.63	0.74	0.00	0.57	0.46
EBRPD - Wildcat Canyon Regional Park	1.67	0.21	0.21	0.00	0.19	0.15
Proposed Action Annual Totals	**27.05**	**3.59**	**5.05**	**0.01**	**3.44**	**2.54**

Comparing these totals to the significance thresholds listed in Table 4.6-4 indicates that the unmitigated criteria pollutant emissions from the combined proposed and connected actions would not exceed the significance thresholds if all proposed and connected actions were completed in the same 10-year period. In addition, the proposed and connected action emissions would not exceed the General Conformity *de minimis* threshold. Therefore, emissions of CO, VOC, NOx, SOx, PM-10, and PM-2.5 from the proposed and connected actions would be less than significant.

5.5.3 Avoidance and Mitigation Measures

Although mitigation is not required since the impacts are less than significant all burning would be performed in conformance with Bay Area Air Quality Management District rules and regulations including “Burn Day” requirements. In addition, watering of the construction site would be conducted twice per day during access road construction on the sites requiring new or repaired access roads.

5.6 Climate and Microclimate

This section discusses the impacts on global climate and local microclimate, including the emissions of greenhouse gases (GHG), which potentially affect global climate change, as well as typical changes to microclimate parameters. In addition, potential impacts of climate change on the project area are also discussed.

As with the analysis in the Air Quality section (Section 5.5), standard emission estimation models approved by the California Air Resources Board (CARB) and EPA were used to estimate the proposed and connected actions and the no action alternative GHG emissions. As noted in Section 5.5, it was assumed that the implementation of the proposed and connected actions would occur over a 10-year period. While the bulk of the emissions would likely occur during the first 1 to 3 years of implementation for a given site, not all sites would be started in the same year.

In general, the fuel reduction activity emissions were estimated using appropriate GHG emission factor models and spreadsheet calculations. CARB's latest on-road vehicle emission factor model, EMFAC2011 (CARB 2011) was used to estimate on-road vehicle emissions from worker automobile travel to and from the work sites, as well as from heavy-duty diesel trucks used to haul wood, chips or material to or from the sites. Since EMFAC2011 only provides CO_2 emission factors, the other combustion-related greenhouse gas emissions, methane (CH_4) and nitrous oxide (N_2O) were estimate using the ratios of CH_4/CO_2 and N_2O/CO_2 emissions in EPA (2012g) for gasoline light duty automobiles and light duty trucks; and for heavy duty diesel trucks. The latest CARB off-road equipment emissions model, OFFROAD 2007 (CARB 2006) was used to estimate off-road mobile equipment (feller/bunchers, skidders, chainsaws, air compressors, etc.) emissions. Emission factors from EPA AP 42 guidelines were used to estimate fugitive emissions from entrained road dust and prescribed burning.

The following construction sources and activities were analyzed for GHG emissions:

- Onsite access road construction equipment emissions (CARB 2006, CARB 2011)
- Onsite logging and debris removal equipment (CARB 2006)
- Offsite haul truck engine emissions (CARB 2011)
- Offsite worker vehicle trips to and from the sites (CARB 2011)
- Prescribed burning (EPA 1996).

The equipment and activity specific GHG emission factors are presented in Table 5.6-1 for on-road vehicle travel.

Table 5.6-2 presents the emission factors for off-road construction equipment engines. Most types of logging equipment potentially used on this action could be found in the OFFROAD2007 (CARB 2006) model. However, masticators were not explicitly identified; therefore, it was assumed the masticator unit would be mounted on a skid-steer loader.

Table 5.6-1. On-Road Vehicle Greenhouse Gas Emission Factors

Trip Type	VMT/ Trip[1]	Number of Trips[2]	VMT/ day	CO_2 (lbs/day) Pavley+LCFS	N_2O (lbs/day)	CH_4 (lbs/day)
Worker Trips	30	2	60	46.439	0.0023	0.0027
Worker Trips	1	2	2	2.550	0.0001	0.0001
Dump Truck Trips	40	2	80	310.735	0.0029	0.0077
Dump Truck Trips	1	2	2	13.448	0.0001	0.0003
Water Truck	20	2	40	158.280	0.0015	0.0039
Water Truck	1	2	2	13.448	0.0001	0.0003
Log/Chip Haul Truck Trips	75	2	150	578.071	0.0053	0.0143
Lo(g)/Chip Haul Truck Trips	1	2	2	13.614	0.0001	0.0003
Firewood Haul Truck Trips	40	2	80	311.098	0.0029	0.0077
Firewood Haul Truck Trips	1	2	2	13.614	0.0001	0.0003

Sources: CARB 2011; EPA 2012g.

Notes:

CO_2 = carbon dioxide, lbs/day = pounds per day LCFS = low carbon fuel standards, VMT = vehicle miles traveled

[1] Distance based on one-way trips.

[2] Trips = one-way trip. Two one-way trips = one round trip. CO_2 emissions are for a round trip.

Table 5.6-2. Off-Road Equipment Greenhouse Gas Emission Factors

Equipment	Fuel[1]	Max HP	Fuel Used gal/day per unit	Engine GHG Emission Rates, lbs/day/unit		
				CO_2	N_2O	CH_4
Air Compressors	G4	15	0.4644	4.4666	0.0056	0.0041
Chainsaws	G2	2	0.0662	0.5409	0.0009	0.0069
Chainsaws Preempt	G2	15	0.1599	1.3076	0.0014	0.0166
Chippers/Stump Grinders-Trailer	G4	25	6.9405	64.3272	0.0429	0.0621
Chippers/Stump Grinders	D	500	14.0392	309.9953	0.0000	0.0160
Dozers (Crawler Tractors)	D	120	9.9476	216.6465	0.0000	0.0384
Fellers/Bunchers	D	250	35.4280	782.5101	0.0000	0.0426
Loaders, Rubber Tired	D	120	8.2812	180.6812	0.0000	0.0269
Loaders, Skid Steer	D	50	3.1371	68.1499	0.0000	0.0125
Mowers, Rear Engine Riding	G4	15	0.3446	3.3698	0.0034	0.0018
Skidders	D	175	28.9688	635.4924	0.0000	0.0469
Trimmers/Edgers/Brush Cutters	G2	2	0.0206	0.1983	0.0004	0.0014
Trimmers/Edgers/Brush Cutters	G4	5	0.0160	0.1774	0.0006	0.0002

Source: CARB 2006

Notes:

CH_4 = methane, CO_2 = carbon dioxide, gal/day = gallons per day, GHG = greenhouse gas, HP = horsepower, lbs/day = pounds per day, N_2O = nitrous oxide

[1] Fuel type designations:

G2 = Gasoline for 2-stroke engines (such as chainsaw engines)

G4 = Gasoline for 4-stroke engines (such as automobile and large equipment engines)

D = Diesel for all diesel fueled engines

The emission factors for prescribed burning are presented in Table 5.6-3. The quantity of material available on a site was based on the disturbed acreage and mix of vegetation identified on each site. The amount of this material that was left on site for burning was based on applicant estimates for each site.

Table 5.6-3. Prescribed Burn Greenhouse Gas Emission Factors

Fuel Type	Estimated Average Fuel Loading, kg/acre	GHG Emission Factors, g/kg fuel[1]		
		CO_2	N_2O	CH_4
Eucalyptus/Acacia	23,743 [2]	NA	0.23	6.1
Oak/Bay	7,799 [3]	NA	0.23	6.1
Pine	17,396 [3]	NA	0.23	5.7
Piled (Mixed)	5,693 [3]	NA	0.23	1.8
Scrub	5,055 [3]	NA	NA	6.2
Chaparral	11,433 [3]	NA	NA	4.5
Grass	591 [3]	NA	NA	NA

Sources:
[1] EPA 1996
[2] Fuel loading for eucalyptus is an average of values from Agee, et al. 1973 and NPS 2006.
[3] Fuel loadings are averages from Clinton, et al. 2006; NPS 2006; and Russell and McBride 2003.
Notes:
CH_4 = methane, CO_2 = carbon dioxide, g/kg = grams per kilogram, GHG = greenhouse gas, kg/acre = kilograms per acre, N_2O = nitrous oxide

The factors for equipment and burning were used with estimated activity levels, such as number of pieces of equipment, number of days of active operation, disturbed acreage, and vehicle miles traveled to determine total and annual emissions of GHGs. The same methodology used to estimate criteria pollutant emissions, described in Section 5.5, was used to estimate GHG emissions in this section. Truck removal of wood and debris assumed that the material would be hauled to a commercial cogeneration facility near Woodland, California. The estimated emissions are presented below for the proposed and connected actions and the no action alternative.

5.6.1 No Action Alternative

The description of the no action alternative indicates that only ongoing vegetative fuel reduction following existing practices would be conducted. The acreage and volume of vegetation removed under this alternative would be substantially less than with the proposed and connected actions. In addition, it was assumed that no prescribed burning would be part of the no action alternative, and no access roads would be constructed. Finally, no connected action activities would be conducted under the no action alternative.

5.6.1.1 Climate Change and GHGs

As a measure of the no action alternative impacts on macroclimate (global and regional climate), GHG emissions, by EBRPD park and UCB and Oakland project area, are presented in Table 5.6-4. Detailed emission summaries for each area are presented in Appendix D.

Table 5.6-4. No Action Alternative Greenhouse Gas Emissions by Project Area

Project Area	Total Emissions (metric tons)			
	CO_2	N_2O	CH_4	CO_2e
UCB-Claremont-PDM	20.08	0.000	0.001	20.20
UCB-Strawberry Canyon-PDM	26.15	0.000	0.002	26.30
UCB-Frowning Ridge-PDM	39.69	0.001	0.002	39.92
Oakland - North Hills-Skyline-PDM	19.61	0.000	0.001	19.73
Oakland - Caldecott Tunnel-PDM	16.81	0.000	0.001	16.91
EBRPD - Anthony Chabot Regional Park	70.90	0.001	0.005	71.39
EBRPD - Claremont Canyon Regional Preserve	10.68	0.000	0.001	10.75
EBRPD - Huckleberry Botanic Regional Preserve	3.74	0.000	0.000	3.77
EBRPD - Lake Chabot Regional Park	1.02	0.000	0.000	1.03
EBRPD - Leona Canyon Regional Open Space Preserve	1.02	0.000	0.000	1.03
EBRPD - Miller/Knox Regional Shoreline	4.33	0.000	0.000	4.37
EBRPD - Redwood Regional Park	22.59	0.000	0.001	22.73
EBRPD - Sibley Volcanic Regional Preserve	17.40	0.000	0.001	17.50
EBRPD - Sobrante Ridge Regional Preserve	1.87	0.000	0.000	1.88
EBRPD - Tilden Regional Park	56.98	0.001	0.003	57.31
EBRPD - Wildcat Canyon Regional Park	17.72	0.000	0.002	17.86
Proposed Action Totals	**330.59**	**0.005**	**0.022**	**332.68**

Notes:
CH_4 = methane, CO_2 = carbon dioxide, CO_2e = carbon dioxide equivalent, N_2O = nitrous oxide

The emissions estimates for the no action alternative in Table 5.6-4 and Appendix D do not include emissions from a wildfire. A major wildfire would be more likely under the no action alternative. The 1991 Oakland Tunnel Fire burned 1,500 acres. Under the proposed and connected actions, EBRPD would cut a portion of the vegetation on 1,600 acres and would burn a portion of the cut vegetation. Another fire similar to the 1991 fire would generate a greater quantity of air emissions, and in higher concentrations, than the prescribed burning planned by EBRPD.

In the absence of wildfire, the GHG emissions from the no action alternative would be substantially less than the 25,000 metric tons per year threshold for quantification listed in the Council on Environmental Quality draft guidance (CEQ 2010). Therefore, in the absence of wildfire, emissions of GHG under the no action alternative are considered less than significant from the standpoint of global climate change.

5.6.1.2 Microclimate

Since the no action alternative would not substantially change the existing vegetation structure the impact of this alternative on microclimate would be less than significant.

5.6.2 Proposed and Connected Actions

5.6.2.1 Climate Change Impacts on the Project Areas

Anticipated changes in surface air temperature, precipitation, and sea level rise in the project area are discussed in Section 4.7.3.4. The changes estimated for air temperature, precipitation, and sea level may have impacts on wildfires in the East Bay Hills and on the shoreline in certain project sites.

The anticipated decreases in precipitation coupled with increasing surface air temperatures could potentially lead to increased risk of wildfires and increased total areas burned (Karl et al. 2009). Recent studies of wildfire risk in the San Francisco Bay area indicate that the risk by 2100 would be substantially higher (factors of 2-fold to 9-fold higher) than in the 1971-2000 base period (Moser et al. 2012). The extent to which wildfire risk increases depends on the way human development advances at the wildland-urban interface. In some instances, this factor is more important than climate change alone. The most extreme increases in residential fire risks result from a combination of high population growth, high sprawl, and warmer-drier climate change scenarios, especially in San Francisco Bay and Southern California counties (Moser et al. 2012).

As noted in Section 4.7.3.4, sea level rise projections for the San Francisco Bay area range from 10 inches to 18 inches by 2050 (Moser et al. 2012; Cayan et al. 2012), and may reach 31 inches to 55 inches by 2100 (Karl et al. 2009; Moser et al. 2012; Cayan et al. 2012). Extreme sea level rise events (storm surge) may occur for up to 100 hours per year by 2050 and may exceed 3,000 hours per year by 2100 in the area (Cayan et al. 2012). This level of sea rise would have detrimental impacts on coastal areas, including the Miller/Knox Regional Shoreline, eroding or swamping the site and destroying biological resources.

5.6.2.2 Impacts on Climate Change

Greenhouse gas emissions for the proposed action, by project area, are presented in Table 5.6-5. The additional emissions associated with the connected actions are presented in Table 5.6-6, and the combined proposed and connected action emissions, by project area, are presented in Table 5.6-7. Detailed emission summaries for each project area are presented in Appendix D.

Table 5.6-5. Proposed Action Greenhouse Gas Emissions by Project Area

	Total Emissions (metric tons)			
Project Area	**CO_2**	**N_2O**	**CH_4**	**CO_2e**
UCB-Claremont-PDM	193.40	0.002	0.014	194.26
UCB-Strawberry Canyon-PDM	224.09	0.002	0.016	225.08
UCB-Frowning Ridge-PDM	441.92	0.004	0.032	443.89
Oakland - North Hills-Skyline-PDM	206.39	0.002	0.015	207.31
Oakland - Caldecott Tunnel-PDM	162.97	0.002	0.012	163.70
EBRPD - Anthony Chabot Regional Park	696.18	0.042	0.945	729.15
EBRPD - Claremont Canyon Regional Preserve	56.69	0.010	0.138	62.83
EBRPD - Huckleberry Botanic Regional Preserve	6.51	0.005	0.101	10.14
EBRPD - Lake Chabot Regional Park	0.39	0.000	0.002	0.48
EBRPD - Leona Canyon Regional Open Space Preserve	1.94	0.001	0.021	2.62
EBRPD - Miller/Knox Regional Shoreline	65.67	0.012	0.194	73.60
EBRPD - Redwood Regional Park	102.95	0.025	0.286	116.75

Table 5.6-5. Proposed Action Greenhouse Gas Emissions by Project Area

Project Area	Total Emissions (metric tons)			
	CO_2	N_2O	CH_4	CO_2e
EBRPD - Sibley Volcanic Regional Preserve	87.71	0.024	0.266	100.67
EBRPD - Sobrante Ridge Regional Preserve	1.12	0.000	0.008	1.40
EBRPD - Tilden Regional Park	305.35	0.073	0.788	344.55
EBRPD - Wildcat Canyon Regional Park	44.38	0.006	0.174	49.83
Proposed Action Totals	**2,597.66**	**0.211**	**3.011**	**2,726.28**

Notes:
CH_4 = methane, CO_2 = carbon dioxide, CO_2e = carbon dioxide equivalent, N_2O = nitrous oxide

Table 5.6-6. Connected Actions Greenhouse Gas Emissions by Project Area

Project	Total Emissions (metric tons)			
	CO_2	N_2O	CH_4	CO_2e
EBRPD - Anthony Chabot Regional Park	1,500.68	0.358	3.456	1,684.11
EBRPD - Claremont Canyon Regional Preserve	58.55	0.023	0.546	77.22
EBRPD - Huckleberry Botanic Regional Preserve	0.12	0.000	0.002	0.18
EBRPD - Redwood Regional Park	86.37	0.066	0.621	120.00
EBRPD - Sibley Volcanic Regional Preserve	404.15	0.092	0.940	452.45
EBRPD - Tilden Regional Park	307.29	0.111	1.097	364.73
EBRPD - Wildcat Canyon Regional Park	114.65	0.044	0.422	137.08
Connected Action Totals	**2,471.82**	**0.694**	**7.084**	**2,835.78**

Notes:
CH_4 = methane, CO_2 = carbon dioxide, CO_2e = carbon dioxide equivalent, N_2O = nitrous oxide

Table 5.6-7. Combined Proposed and Connected Actions Greenhouse Gas Emissions by Project Area

Project	Total Emissions (metric tons)			
	CO_2	N_2O	CH_4	CO_2e
UCB-Claremont-PDM	193.40	0.002	0.014	194.26
UCB-Strawberry Canyon-PDM	224.09	0.002	0.016	225.08
UCB-Frowning Ridge-PDM	441.92	0.004	0.032	443.89
Oakland - North Hills-Skyline-PDM	206.39	0.002	0.015	207.31
Oakland - Caldecott Tunnel-PDM	162.97	0.002	0.012	163.70
EBRPD - Anthony Chabot Regional Park	2,196.86	0.400	4.401	2,413.26
EBRPD - Claremont Canyon Regional Preserve	115.25	0.034	0.684	140.05
EBRPD - Huckleberry Botanic Regional Preserve	6.63	0.005	0.103	10.32
EBRPD - Lake Chabot Regional Park	0.39	0.000	0.002	0.48
EBRPD - Leona Canyon Regional Open Space Preserve	1.94	0.001	0.021	2.62
EBRPD - Miller/Knox Regional Shoreline	65.67	0.012	0.194	73.60
EBRPD - Redwood Regional Park	189.32	0.092	0.907	236.75
EBRPD - Sibley Volcanic Regional Preserve	491.86	0.116	1.206	553.12
EBRPD - Sobrante Ridge Regional Preserve	1.12	0.000	0.008	1.40
EBRPD - Tilden Regional Park	612.63	0.184	1.886	709.28
EBRPD - Wildcat Canyon Regional Park	159.04	0.050	0.595	186.91
Combined Proposed and Connected Action Totals	**5,069.47**	**0.905**	**10.095**	**5,562.06**

Notes:
CH_4 = methane, CO_2 = carbon dioxide, CO_2e = carbon dioxide equivalent, N_2O = nitrous oxide

Finally, it is anticipated that many of the sites would include treatment by chipping or pruning woody material and leaving it on site to naturally decay. The half-life[1] for this material is typically 5 years to over 40 years (Hernandez et al. 2009; DOE 2007), with an average of about 14 years (DOE 2007). The half-life of eucalyptus species is typically shorter than other hardwoods, perhaps 3 to 5 years (Duryea et al. 1999; Hernandez et al. 2009). Since the material is being spread, and not being stored in large stockpiles, the decomposition would generally be aerobic (oxygen would be present). This type of decay would produce some emissions of CO_2 (Lee 2010). Using a half-life of 5 years for eucalyptus and assuming that one-fourth of the CO_2 equivalent (CO_2e) sequestered in the baseline condition (see Table 4.7-3 in Section 4.7) was trimmed or chipped and left on site, the annual average CO_2e emission rate from the decay of woody material would roughly average 1,500 metric tons per year over the 10-year program period. Note that this CO_2 would be consumed by the increased growth in vegetation that would occur after the sites are treated.

In total, GHG emissions would be roughly 2,050 metric tons per year (550 metric tons per year from treatment under the proposed and connected actions plus 1,500 metric tons from annual decomposition), which is less than the 25,000 metric tons per year threshold for quantification listed in the CEQ draft guidance (CEQ 2010). It should be noted that the emission of CO_2 from burning was not calculated since the removal of this vegetation would allow new vegetation to grow, eventually consuming at least a portion the CO_2 released during burning, as noted in EPA emission factor guidance (EPA 1996). In addition, fire management has been shown to sequester more carbon than unmanaged forests, as discussed in Section 5.6.3 below. The emissions of N_2O and CH_4 were quantified for burning, since these compounds are not needed or consumed by growing vegetation.

In conclusion, emissions of GHGs from the proposed and connected actions would be less than the draft quantification thresholds proposed by the CEC, and are considered less than significant from a global climate change standpoint.

5.6.2.3 Impacts on Microclimate

As discussed in Section 4.7, the key climate parameters that define the microclimate for a given woodland or tree stand include: sunlight penetration, moisture and precipitation, wind speed, and resulting air and soil temperatures (Aussenac 2000, Chen et al. 1999, Oke 1987).

Several studies have looked at the changes in these parameters when trees were removed from a forest or woodland site. The studies have included the comparison of microclimate parameters in the forested site as well as in clear cut or partial cut (thinning) areas (Aussenac 2000; Barg and Edmonds 1999; Chen et al. 1995; Chen et al. 1993; Miller 1977; Rambo and North 2009; Zheng et al. 2000). A number of these studies have indicated that edge or transition between open areas and forests represent a separate ecosystem that has parameter values that are different than either the open ground or interior forest areas (Chen et al. 1999; Chen et al. 1995; Chen et al. 1993;

[1] The half-life of decaying wood is the time it takes one-half of the material to decay and no longer be part of the original wood.

Davies-Colley 2000; Gehlhausen et al. 2000; Gray et al. 2002; Heithecker and Halpern 2007; Matlack 1993).

5.6.2.3.1 Sunlight

With regard to sunlight and photosynthesis, these studies have found that the amount of sunlight penetrating to the ground increases as the density of tall trees is reduced, and that, not surprisingly, clear-cut areas received more direct sunlight than thinned areas (Aussenac 2000; Chen et al. 1999; Chen et al. 1995; Chen et al. 1993; Davies-Colley 2000; Heithecker and Halpern 2007; Matlack 1993; Rambo and North 2009; Zheng et al. 2000). Because the lower story and ground surfaces receive more sunlight after tree removal, photosynthetic activity in these lower regions increases substantially (Aussenac 2000; Davies-Colley 2000; Gray et al. 2002).

The immediate impact of tree and brush removal would be a change in ambient air and soil temperatures within the treated area. The maximum daily air temperatures would typically be higher and minimum daily air temperatures would typically be lower than before vegetation removal. While the daily temperature range increases with removal treatments, the average daily temperature tends to be less affected since the increased maximum temperature and decreased minimum temperature tend to balance the daily average temperature. As the understory trees and shrubs grow, the maximum and minimum temperatures would return to the pre-removal values. Soil temperatures tend to rise in the treated area.

Also the lowering of the effective vegetation height increases the albedo, thus more direct sunlight is reflected back to the atmosphere and to space (Hungerford et al. 1989; Oke 1987). This provides a negative feedback to the possible effects of removing the vegetation with regard to atmospheric warming. The removal of vegetation, in particular when burning is used for disposal, results in release of CO_2 back to the atmosphere, thus potentially increasing the warming impact. On the other hand, increasing the albedo of the surface through vegetation removal decreases the energy that is absorbed by the surface and re-emitted as long wave radiation. It is the long-wave radiation that contributes to atmospheric warming. The short-wave radiation from the sun is not as effective in warming the atmosphere directly as long-wave radiation (Oke 1987).

5.6.2.3.2 Moisture and Precipitation

The removal of trees and vegetation would have both direct and indirect impacts on precipitation and soil moisture, which for some interactions would increase soil moisture and for others would decrease soil moisture.

Precipitation

Removing the tree canopy would reduce the amount of intercepted rainwater (i.e., the water caught by the trees that doesn’t reach the ground). For trees, this intercepted rainfall may be between 30 and 45% of the annual rainfall (Aussenac 2000). Therefore, removing trees would increase the amount of rainfall that reaches the ground surface. The impact that this additional rainfall would have on surface water runoff and soil erosion is discussed in Section 5.3.3, Soils.

As noted in Section 4.7, trees can capture fog water, which drips to the ground and increases the total annual precipitation to the ground under the trees. For the East Bay Hills, this may represent an important source of precipitation during the drier summer months. One study in the East Bay Hills indicated that up to 10 inches per summer could be produced by Monterey pines (Parsons 1960).

Parsons (1960) noted that the level of tree-captured fog-drip water is a function of (1) size, shape, and nature of the trees, and (2) wind speed. Pine trees on foggy nights without much air movement only produced 0.02 to 0.05 inches of fog-drip water, while on foggy nights with 10 to 15 miles per hour (mph) westerly winds, the same trees would produce 0.20 to 0.30 inches. Several foggy nights with even higher wind speeds produced 0.50 inches or more. The potential correlation between wind speed and fog-drip water production by trees is consistent with the findings that exposure to wind is important for fog-drip water collection studies by others (Oberlander 1956; Ingraham and Matthews 1995). In his discussion, Parsons did not mention the quantity of fog-water collected by eucalyptus, although he noted that rain gauges were placed under both Monterey pines and eucalyptus trees (Parsons 1960).

The overall direct impact on precipitation of thinning or removing trees and vegetation from the East Bay Hills appears to be that more rainfall but less fog-drip water would reach the ground. Thus, the annual precipitation reaching the ground may not be substantially different after treatment than before. The increase in direct rainfall to the ground would be during the wet season and may produce additional surface water runoff and ponding. However, the decrease in fog-drip water would occur during the summer months when fog would be most prevalent. With the removal of tall trees, the lack of summertime water would shorten the growing season and decrease the growth rate for replacement scrub and tree communities. The active growing season would be largely confined to the spring and early summer, which was the natural condition that existed before the introduction of eucalyptus and pine to the area. This impact would occur wherever fog-drip from trees provided substantial summertime precipitation and would be greatest along the ridges where wind-driven fog directly impacts the trees.

Soil Moisture and Evapotranspiration

The soil moisture content and soil water potential has been studied for various types of forests and woodlands under different methods of clearing or thinning configurations.

One potential impact that removing trees is that the depth to the water table may rise noticeably beneath the cleared or thinned area (Aussenac 2000). The rise is caused potentially by the reduction in water consumed by vegetation (less vegetation) and increased direct rainfall on the opened site. The impact on the remaining vegetation would depend on the duration and new depth to this water table. It is likely that in semi-arid regions, the impact is beneficial in that it represents an additional groundwater reserve which supplies the soil water reserve. This conclusion would be consistent with studies of soil moisture in gaps, thinned and clearcut forest sites (Barg and Edmonds 1999; Gray et al. 2002).

Evaluation of stream flow in Caspar Creek in northwestern California indicate that logging by either clear-cutting or selective tractor harvesting resulted in measurable increases in post-harvest stream flow for both annual periods and the low-flow season. An increase of

approximately 15% per year was estimated. In one study, the increased flow was observed to disappear within 5 years (Keppeler and Ziemer 1990), while increase flow was noted at least 7 to 8 years after the harvest (Keppeler 1998).

A study of soil water content under tree stand canopies and inter-canopy spaces indicated that the rate of water loss from soil in the later afternoon for the month of July increased faster in the intercanopy (i.e., open) spaces (Breshears et al. 1998). Other studies indicate that soil moisture can be lower or higher in a treated area compared to the forest interior, depending on the season (Barg and Edmonds 1999; Redding et al. 2002; Smith and Johnson 2004). In one study, the soil moisture in the edge area of a clear-cut opening in an old-growth Douglas-fir forest was higher than either the forest interior or the clear-cut area (Chen et al. 1993).

Overall, the removal of vegetation results in reduced transpiration from that area, which appears to more than compensate for the increased evaporation of water from soil surfaces. This impact, coupled with increased rainfall to the ground surface, is likely to result in increased soil water storage initially after thinning/clearing treatments are completed. The additional stored water would be used by the remaining vegetation for growth.

5.6.2.3.3 Wind Speed

Section 4.7.3.2.3 noted that the wind speed near the ground surface depended on the height of the roughness elements (trees, bushes, buildings, etc.) that could interrupt the wind flow and the density of those elements in an area (Abtew, et al. 1989; Aussenac 2000; Oke 1987; Schroeder and Buck 1970). Increasing the density of trees in woodlands would reduce the wind speed near the ground more than increasing the tree height (Rothermel 1983). In a dry eucalyptus forest, the ratio of wind speed at 30 meters (m) above the ground to that at 1.5 m above the ground is roughly 3 to 1 (Gould et al. 2007). That study also noted that wind gusts do not persist in forested areas; wind felt at one location could be different than that at another location within 40 m of the first.

A wind tunnel study of a simulated forest indicated that the wind speeds below the canopy are noticeably higher in the open area than in the forest (Wuyts et al. 2008). When the wind was measured at an elevation equivalent to one-half of the tree height, the ratio in wind speed between open and forested areas was roughly 5 to 1. When measured at the tree height, this ratio was closer to 3 to 1. Therefore, it is likely that peak wind speeds along the ridges where fuel reduction treatments are proposed could increase immediately after completion of the treatment. This impact would not be as dramatic in areas less exposed to ridge-top winds.

Overall, the vegetation removal treatments would potentially increase near-ground level wind speeds, primarily in areas where larger trees are removed or thinned. This increase would diminish over time as the understory vegetation grows.

5.6.3 Avoidance and Mitigation Measures

The primary purpose of the proposed action is to reduce the wildfire risk in the East Bay Hills through various methods of thinning and vegetation removal. This thinning and removal activity would produce short-term emissions of greenhouse gases from equipment engines and from prescribed burning. These short-term emissions may be countered in the long term when the

impacts and emissions associated with wildfires are considered. Studies indicate that if a wildfire occurs, the proposed type of vegetation management sequesters more carbon in the long term than leaving the sites untreated. Two wildfire modeling studies indicated that thinning would reduce damage caused by wildfires, allowing faster regrowth after a fire (Hurteau and North 2010; Wiedinmyer and Hurteau 2010). The Wiedinmyer and Hurteau (2010) study included the use of prescribed burning as a treatment method.

Another study reviewed actual thinning practices and resulting wildfire damage from 12 wildfires in California (North and Hurteau 2011). A key finding of this study was that the subsequent loss of trees in the untreated areas after the fire was out generated a greater loss of carbon to the atmosphere than the initial thinning practices and wildfire damage in the treated areas. Specifically, untreated sites averaged only 7.8 megagrams of carbon per hectare (Mg C/ha, equivalent to 3.2 metric tons per acre) left in live trees while treated sites averaged 100.5 Mg C/ha (40.7 Mt/acre) in live trees. In addition, 70% of the remaining total ecosystem carbon shifted from decomposing stocks in the untreated forests, while only 19% of the carbon shifted to decomposing stocks in the treated forests (North and Hurteau 2011). Thus, the proposed and connected actions would be self-mitigating if a wildfire occurs.

The proposed and connected actions would also be self-mitigating to some degree in the absence of a wildfire, because native vegetation would partially replace the non-native vegetation removed. However, the planned growth of oak and bay woodlands and successional grassland containing shrub islands would not sequester as much carbon as the larger eucalyptus and pines and the denser coastal scrub that would be removed.

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5.7 Historic Properties

5.7.1 Impact Assessment Methodology

This section describes the evaluation technique and effect categories used to characterize the nature and intensity of changes to historic properties. The effect determinations presented in this section rely on the evaluation of proposed and connected action's and the no action alternative's potential to cause a change in the significance of a historical or archaeological resource, destroy a paleontological resource/site or unique geologic feature, or disturb any human remains to identify any adverse changes to a historic property.

As noted in Section 4.8, background research and pedestrian surveys were completed in the area of potential effect (APE) to determine National Register of Historic Places (NRHP) eligibility for each site and support effect determinations for the sites that were identified as eligible for recommendation.

5.7.2 No Action Alternative

Under the no action alternative, the proposed and connected fuel reduction activities would not be completed by the project applicants. In the short-term, no changes to historic properties would be anticipated. In the long-term, as described in Section 3.4.1, the vegetation management actions anticipated in the absence of any grant funding from FEMA would continue at current levels.

Based on these limited future vegetation management actions, little change to the existing conditions at both the archaeological historic properties and the built environment historic properties described in Section 4.8.4 would be expected. These future vegetation management actions would not produce any long-term adverse effects on historic properties within the APE.

Fuel reduction projects included in the proposed and connected actions are designed to protect historic properties in EBRPD parks, including the Herschell-Spillman merry-go-round, the Botanic Garden, the Golden Gate Live Steamers steam trains, the Tilden Regional Park golf course, the Piedmont Stables, and the Anthony Chabot Equestrian Center. Under the no action alternative, these facilities would be at increased risk of being damaged or destroyed in a wildfire.

Historic properties outside the proposed and connected project areas would also be at increased risk from fire. For example, the 1991 Oakland Tunnel Fire destroyed well over 3,000 structures, including historic buildings.

5.7.3 Proposed and Connected Actions

5.7.3.1 Archaeological Historic Properties

A total of 13 archaeological historic properties are located within the APE and were surveyed as a part of the pedestrian survey. Table 5.7-1 presents the results of these surveys.

Table 5.7-1. Effect of Proposed and Connected Actions on Archaeological Historic Properties

Site Number/Name	Recommended NRHP Eligible[1]	Vegetation Management Actions Anticipated	Intensity of Effect
P-1-00158	R	The Grass Valley Trail currently used for recreation.	No adverse effect
CA-CCO-125 / Alvarado Park P-07-000323	R	No excavation or ground disturbance is expected within the boundaries of prehistoric sites.	No adverse effect
CA-CCO-274 / Alvarado Park P-07-000323	R	No excavation or ground disturbance is expected within the boundaries of prehistoric sites.	No adverse effect
CA-CCO- 349 / Alvarado Park P-07-000323	R	No excavation or ground disturbance is expected within the boundaries of prehistoric sites.	No adverse effect
CA-CCO-353 / Alvarado Park P-07-000323	R	No excavation or ground disturbance is expected within the boundaries of prehistoric sites.	No adverse effect
CA-CCO-373 / Alvarado Park P-07-000323	R	No excavation or ground disturbance is expected within the boundaries of prehistoric sites.	No adverse effect
P-07-00801	NR		
P-07-00802	NR		
S-GC-1 (formerly EBRPD's mkhs002)	R	Area around archaeological site clear of vegetation	No adverse effect
S-GC-2	NR		
S-GC-3	NR		
S-PR-1 (formerly URS EBH-7)	NR		
TIHS006	R	Water conveyance feature would not be disturbed.	No adverse effect

[1] L- NHRP Listed
NR – Not recommended for NHRP eligibility
R – Recommended for NHRP eligibility

The eight archaeological historic properties identified for recommendation as NHRP eligible were all determined to be located in portions of the proposed and connected project areas that are currently clear of vegetation and would not be subject to disturbance from vegetation management actions or were located in areas where no excavation or ground disturbance would be anticipated. As a result, the proposed and connected actions would not be expected to adversely affect archaeological historic properties.

5.7.3.2 Built Environment Historic Properties

A total of 25 built environment historic properties, including districts, structures, and buildings are located within the APE and were surveyed as a part of the pedestrian survey. Table 5.7-2 presents the results of these surveys.

Table 5.7-2. Effect of Proposed and Connected Actions on Built Environment Historic Properties

Site Number/Name	NRHP Listed/Recommended NRHP Eligible[1]	Vegetation Management Actions Anticipated	Intensity of Effect
Alvarado Park P-07-000323	R	Vegetation management actions have the potential to cause indirect visual impacts that could impact the park's historic setting, feeling, and overall historic character; however, this effect is offset by the potential negative and destructive impact to historic properties in the park from threat of fire.	No adverse effect
Anthony Chabot Regional Park	NR		
5750 Redwood Road Oakland	L	Equestrian facility is surrounded by parking lots, open spaces, and pastures. Vegetation management actions would not be anticipated to interfere with structures on site.	No adverse effect
14600 Skyline Blvd.	L	Equestrian facility is surrounded by parking lots, open spaces, and pastures. Vegetation management actions would not be anticipated to interfere with structures on site.	No adverse effect
9999 Redwood Road, Castro Valley, CA	NR		
Tilden Regional Park	L	Equestrian facility is surrounded by parking lots, open spaces, and pastures. Vegetation management actions would not be anticipated to interfere with structures on site.	No adverse effect
Volmer Peak Nike Radar/2501 Grizzly Peak Blvd.	NR		
S-MV-3	NR		
tihs026	NR		
T-S-PR-5	NR		
tihs011	NR		
P-07-000799/P-01-002179	L	The long-term operation of the Tilden Steam Trains would remain unchanged, and vegetation management actions would not be anticipated to interfere with short-term operations.	No adverse effect

Table 5.7-2. Effect of Proposed and Connected Actions on Built Environment Historic Properties

Site Number/Name	NRHP Listed/Recommended NRHP Eligible[1]	Vegetation Management Actions Anticipated	Intensity of Effect
Claremont Canyon Regional Preserve	NR		
Huckleberry Botanic Regional Preserve	NR		
Kennedy Grove Regional Recreation Area	NR		
Miller/Knox Regional Shoreline Historic District	NR		
810 Dornan Dr.	NR		
mkhs003/S-MV-1	NR		
Leona Canyon Regional Open Space Preserve	NR		
734 Gelston Ave.	NR		
Point Pinole Regional Shoreline	NR		
Redwood Regional Park	R	Vegetation management actions have the potential to cause indirect visual impacts that could impact the park's historic setting, feeling, and overall historic character; however, this effect is offset by the potential negative and destructive impact to historic properties in the park from threat of fire.	No adverse effect
8500 Skyline Blvd	NR		
10900 Skyline Blvd.	NR		
S-MV-2	NR		
11500 Skyline Blvd.	NR		
6525 Redwood Road	R	Vegetation management actions have the potential to cause indirect visual impacts that could impact the park's historic setting, feeling, and overall historic character; however, this effect is offset by the potential negative and destructive impact to historic properties in the park from threat of fire.	No adverse effect
P-01-002182	NR		

Table 5.7-2. Effect of Proposed and Connected Actions on Built Environment Historic Properties

Site Number/Name	NRHP Listed/Recommended NRHP Eligible[1]	Vegetation Management Actions Anticipated	Intensity of Effect
Sibley Volcanic Regional Preserve	R	Vegetation management actions have the potential to cause indirect visual impacts that could impact the park's historic setting, feeling, and overall historic character; however, this effect is offset by the potential negative and destructive impact to historic properties in the park from threat of fire.	No adverse effect
6800 Skyline Blvd	NR		
Sobrante Ridge Regional Preserve	NR		
Strawberry Canyon	NR		
Temescal Regional Recreation Area	NR		
Wildcat Canyon Regional Park	NR		

[1] R – Recommended for NHRP eligibility
NR – Not recommended for NHRP eligibility
L- NHRP Listed

The eight built environment historic properties located within the APE that have either been identified or recommended as NHRP eligible were all determined to be located in portions of the proposed and connected project areas that are sufficiently separated from the vegetation management actions to prevent their interaction with structures on site, or in the case of the four parks considered eligible for the NRHP, where vegetation management actions have the potential to cause indirect visual impacts that could impact the park's historic setting, feeling, and overall historic character. These potentially adverse historic property effects would be offset by the proposed and connected action's reduction in "the possibility of far greater and more destructive effects through unmitigated catastrophic wildfire damage and emergency responses to fires." (EBRPD 2009d) As a result, the proposed and connected actions would not be expected to adversely affect built environment historic properties.

5.7.4 Mitigation Measures

No mitigation measures are specified for effects to historic properties.

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5.8 Aesthetics and Visual Quality

5.8.1 Impact Assessment Methodology

This section describes the evaluation technique and effect categories used to characterize the nature and intensity of changes to aesthetics and visual quality.

Evaluation techniques for determining when adverse change to a public view point's aesthetics and visual quality would occur were described in the article *The Visual Modification Class Approach to Preparing NEPA and CEQA Compliance Visual Impact Assessments* (Headley 2010) and are listed below. An adverse change would occur when:

- Features are altered, introduced, made less visible, or are removed, such that the resultant effect on public views is perceptibly incongruous with the inherent, established character of the landscape. Changes that seem incongruous are those that appear out of place, discordant, or distracting.
- Access to public views is diminished or eliminated by screening or blocking of the affected view; and/or physical access to public viewing positions is restricted or eliminated.

These two indicators of an adverse change have been applied in this EIS to identify potential changes in visual modification class ratings as a metric to characterize potential impacts on aesthetics and visual quality.

Headley (2010) outlined an approach for measuring the visual impact of an action through evaluation of the reduction in the visual modification class rating the action would cause at important viewing points in the study area. Under this approach the potential reduction of visual modification class ratings is then considered against the public's sensitivity to adverse scenic/visual quality changes at each important viewing point. This comparison of magnitude and public sensitivity to adverse change can then be used to determine the intensity of each effect. Table 5.8-1 below outlines the approach used in this EIS to determine the potential intensity of changes to the twenty one viewing points identified in the study area. In instances where implementation of the proposed and connected actions or the no action alternative would be expected to generate a beneficial effect by resulting in changes like opened sightlines providing access to an expansive view this is noted.

The potential for change in the visual modification class rating identified for each viewing point and the proposed and connected project areas associated with each viewing point are analyzed in this section.

Table 5.8-1. Impact Magnitude and Public Sensitivity as a Measure of Intensity[1]

	Public Sensitivity[3]			
Impact Magnitude[2]	**High**	**Moderate**	**Low**	**None**
None	N	N	N	N
Level 1	SA	A	A	A
Level 2	SA	SA	A	A
Level 3	SA	SA	SA	A

Notes:

(1) **Intensity:**
SA: Significant Adverse, if the effect persists for an appreciable duration, generally one year or more. In some cases the temporal viewing context may indicate that impacts lasting less than one year may represent a substantial (significant) impact.
A: Adverse but not significantly adverse, regardless of duration.
N: No Effect

(2) **Magnitude of Impact:**
(None): No reduction in visual condition
(Level 1): A reduction in visual condition by one visual modification class rating
(Level 2): A reduction in visual condition by two visual modification class ratings
(Level 3): A reduction in visual condition by three visual modification class ratings

(3) **Public Sensitivity**
High:
The potential for public concern over adverse change in scenic/visual quality is great. Affected views are rare, unique, or in other ways are special and highly valued in the region or locale. Even the smallest perceptible change in visual conditions (Impact Magnitude Level 1 [see below]) would be considered to be a substantial (significant) lessening of visual quality.
Moderate:
The potential for public concern over adverse change in scenic/visual quality is appreciable. Affected views are secondary in importance or similar to views commonly found in the region or locale. A moderately to highly intense visual impact (Impact Magnitude Levels 2 or 3) would be perceived as a significant lessening of visual quality.
Low:
Generally, there may be some indication that a small minority of the public has a concern over scenic and visual resource impacts on the affected area. Only the greatest intensity of adverse change in the condition of aesthetics and visual resources (Impact Magnitude Level 3) would have the potential to register with the public as a substantial reduction in visual quality.
No Sensitivity (None):
The views are not public, or there are no indications of public concern over, or interest in, scenic/visual resource impacts on the affected area.

5.8.2 No Action Alternative

Under the no action alternative the proposed and connected actions would not be implemented. In the short term, no changes to the existing aesthetic and visual quality would be anticipated. In the long term, as described in Section 3.4.1, the vegetation management actions anticipated in the absence of any grant funding from FEMA would continue at current levels.

Based on these limited future vegetation management actions, little change in aesthetics and visual quality at the viewing points and associated proposed and connected project areas would be expected. The conditions anticipated as a result of the no action alternative are outlined in Table 5.8-2.

Table 5.8-2. No Action Alternative—Effect on Aesthetics and Visual Quality

Viewing Point ID	Public Sensitivity	Existing Visual Modification Class[1]	No Action Visual Modification Class[1]	Intensity of Effect
1	High	1	1	No adverse effect
2	High	2	2	No adverse effect
3	Low	2	2	No adverse effect
4	High	1	1	No adverse effect
5	High	1	1	No adverse effect
6	High	1	1	No adverse effect
7	High	3	3	No adverse effect
8	High	2	2	No adverse effect
9	High	1	1	No adverse effect
10	High	2	2	No adverse effect
11	High	2	2	No adverse effect
12	Moderate	3	3	No adverse effect
13	High	1	1	No adverse effect
14	High	2	2	No adverse effect
15	High	1	1	No adverse effect
16	High	2	2	No adverse effect
17	Moderate	2	2	No adverse effect
18	Moderate	2	2	No adverse effect
19	Moderate	2	2	No adverse effect
20	High	2	2	No adverse effect
21	High	2	2	No adverse effect

[1] Visual Modification Class definitions are presented in Section 4.9.2.3.

As indicated in Table 5.8-2, limited vegetation management actions anticipated under the no action alternative would not cause reductions in existing visual modification class ratings at the viewing points. Short-term alterations in aesthetics and visual quality would be small in scale and focused in locations adjacent to existing roadways and structures. These alterations would not produce any long-term adverse effects on landscape type or character, visual congruence or coherence.

Aesthetics and visual quality at the viewing points and associated proposed and connected project areas would be adversely affected by a severe wildfire, which would be more likely under the no action alternative. The magnitude and location of these adverse effects is unknown and therefore not identified in Table 5.8-2.

5.8.3 Proposed and Connected Actions

The proposed and connected actions include fuel reduction activities of varying intensity at locations throughout the proposed and connected project areas. Figure 5.8-1 indicates the locations of the important viewing points identified within the project areas that were surveyed in support of this effect analysis. Each of these viewing points were surveyed to determine a visual modification class rating and then compared against the surrounding proposed and connected project areas to identify actions with shared aesthetic and visual quality effects. Figure 5.8-1 also indicates the location of three representative photo simulations completed for this effects analysis. These photo simulations are presented later in this section with the description of the

viewing point where they were taken. Table 5.8-3 presents each viewing points' existing visual modification class rating, the rating anticipated after implementation of the proposed and connected actions, an effect determination, and the areas each determination applies to. The determination for each viewing point applies to the proposed and connected project areas visible from the viewing point and to other associated project areas where visual impacts would be similar for viewers as those at the surveyed viewing points. A narrative explanation of each determination is also presented in this section. The survey logs and detailed maps for each viewing points are presented in Appendix E.

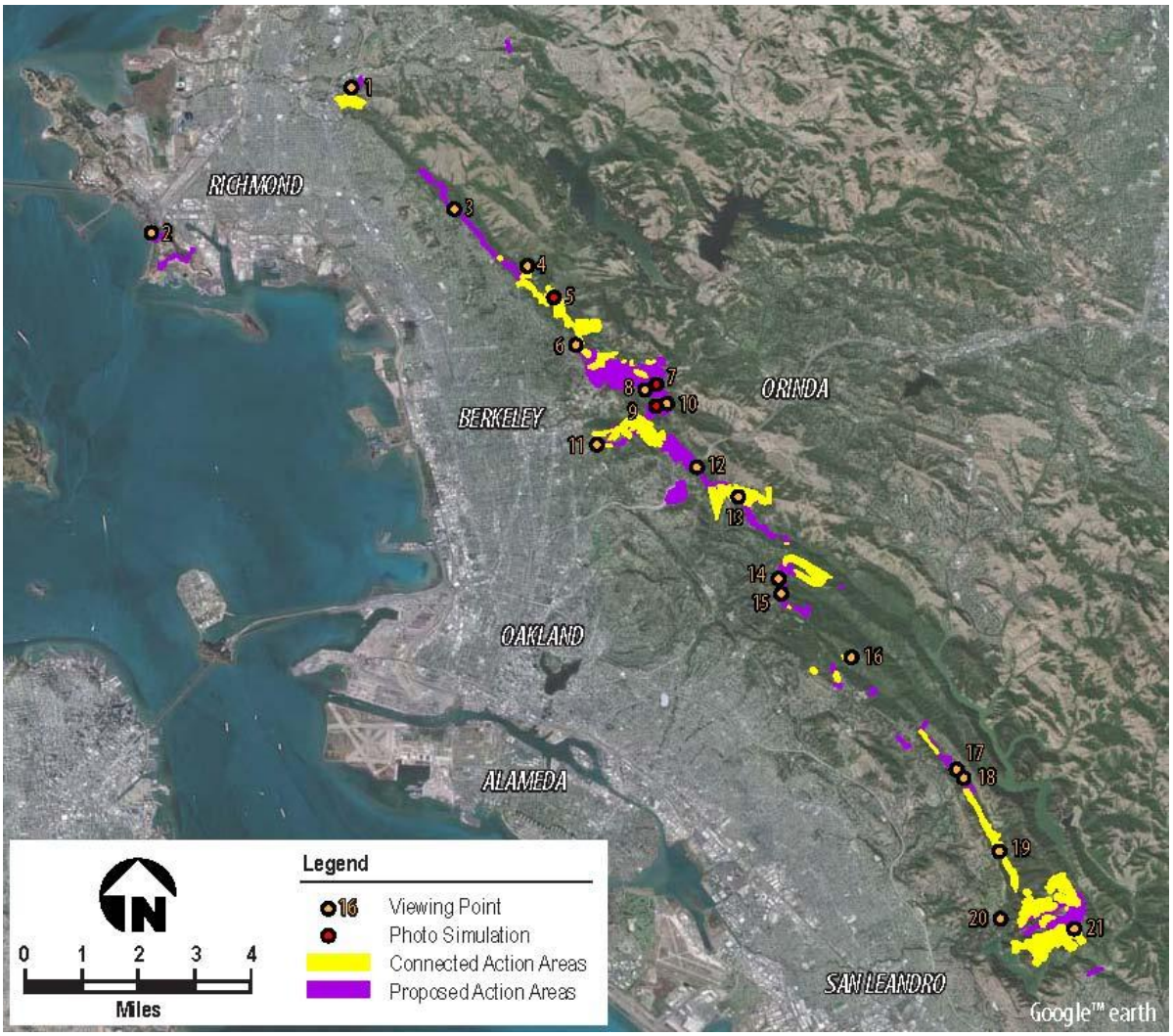

Figure 5.8-1. Important Viewing Points and Photo Simulation Points in the Project Area

Table 5.8-3. Effect of Proposed and Connected Actions on Aesthetics and Visual Quality

Viewing Point ID	Public Sensitivity	Existing Visual Modification Class[1]	Projected Visual Modification Class[1]	Intensity of Effect	Relevant Project Areas[2]
1	High	1	1	No adverse effect	SO001, WC003, WC004, WC005, WC006
2	High	2	2	No adverse effect	MK001, MK003, MK004, MK005
3	Low	2	2	No adverse effect	WC009, WC010, WC011
4	High	1	1	No adverse effect	TI006
5	High	1	2	Significant, adverse	TI008a, TI008b, TI009, TI010
6	High	1	2	Significant, adverse	TI011, TI012, TI013, TI014,TI015,TI016, TI019, TI020, TI021
7	High	3	3	No adverse effect	Strawberry Canyon- PDM, Frowning Ridge- PDM, TI014,TI015,TI016, TI019, TI020, TI021
8	High	2	2	No adverse effect	Strawberry Canyon -PDM, Frowning Ridge-PDM
9	High	1	1	No adverse effect	Strawberry Canyon -PDM, Frowning Ridge- PDM, Claremont-PDM, North Hills-Skyline-PDM, CC001, CC002, CC003, CC004, CC005, CC006, CC007, CC008, CC009, CC011,
10	High	2	2	No adverse effect	Claremont-PDM
11	High	2	2	No adverse effect	CC001, CC002, CC003, CC004, CC005, CC006, CC007, CC008, CC009
12	Moderate	3	3	No adverse effect	North Hills-Skyline-PDM, Caldecott Tunnel-PDM, CC012, SR-001, SR-002, SR003, SR-004
13	High	1	1	No adverse effect	SR005, SR006, SR007, HP001, HP002, HP003, HP004
14	High	2	2	No adverse effect	RD001, RD002, RD003, RD004
15	High	1	1	No adverse effect	RD004, RD005, RD006, RD007, RD008
16	High	2	2	No adverse effect	RD009, AC003
17	Moderate	2	2	No adverse effect	AC006
18	High	2	2	No adverse effect	AC007
19	Moderate	2	2	No adverse effect	AC007
20	High	2	2	No adverse effect	AC010, AC011, AC012, AC013
21	High	2	2	No adverse effect	AC010, AC013, AC014, LC010

[1] Visual Modification Class definitions are presented in Section 4.9.2.3.
[2] These areas are shown on Figures 3-1a through 3-1j in Section 3.

5.8.3.1 Viewing Point 1

Viewing point 1 is on the Bonitas Gate Trail overlooking Alvarado Park and the bay to the west. This viewing point is at the northern edge of proposed project area WC004 and is similar in view type and effect, to changes anticipated at four other proposed and connected project areas as indicated in Table 5.8-3. Treatment actions identified for these areas focus on eucalyptus and French broom removal to support the succession of oak-bay woodland. The duration of view at this viewing point is transient for trail users. The proposed and connected actions would reduce

vegetation density and expand views through the foreground to views of the bay to the west by reducing obstruction for trail users traveling south along the trail from the viewing point. Expanded views of the background to the west generated by vegetation removal would not change the perception of existing landscape features in the foreground or background in a way that would be noticed by trail users. Wood chips generated from the removed trees would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed eucalyptus and French broom that would fade over time. In the short and long-term this modification to 20% of the total project area would not dominate the expanded view from this viewing point. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 1 and associated areas, and would cause no significant adverse effects on aesthetics and visual quality.

5.8.3.2 Viewing Point 2

Viewing point 2 is on Dornan Drive in Richmond, near Keller Beach Park in the Miller/Knox Regional Shoreline. It is down slope from proposed project areas MK001 and MK003 and is similar in view type and effect, to changes anticipated at two other proposed project areas visible from Dornan Drive as indicated in Table 5.8-3. Treatment actions identified for these areas focus on removal of small and dead pine trees and French broom removal to create defensible space for adjacent developed areas. The duration of view at this viewing point is transient for drivers, bicyclists and walkers along Dornan Drive and prolonged for visitors sitting at benches along Dornan Drive and homes adjacent to the project areas. The proposed and connected actions would reduce vegetation density and expand views through the foreground to views of the hillside in the background. Expanded views of the background hillside would not change the perception of views of the existing developed areas in the background, given that the vegetation proposed for removal currently provides little visual screening. Wood chips generated from the removed trees would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed eucalyptus and French broom that would fade over time. In the short- and long-term this modification to 20% of the total project area would not dominate the expanded view from this viewing point. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 2 and associated areas, and would cause no significant adverse effects on aesthetics and visual quality.

5.8.3.3 Viewing Point 3

Viewing point 3 is on Leneve Place at the western edge of proposed project area WC011, overlooking Wildcat Canyon Regional Park. The view type and anticipated visual impacts are similar to those at proposed project areas WC009 and WC010, as indicated in Table 5.8-3. Actions identified for these areas focus on removal of French broom and scrub to promote oak-bay woodland succession, and debris removal to reduce fuel loads. The duration of view at this viewing point is transient for drivers, bicyclists and walkers along Leneve Place and similarly situated streets, and is prolonged for homes on the western edge of the proposed project areas. The proposed and connected actions would reduce vegetation density and expand views through

the foreground to views of the rolling grasslands in the background. Expanded views of the background to the east could improve the perception of existing landscape features in the background for both transient and prolonged viewers. Wood chips generated from the removed trees would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed eucalyptus and French broom that would fade over time. In the short- and long-term this modification to 20% of the total project area would not dominate the expanded view from this viewing point. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 3 and associated areas, and would cause no significant adverse effects and could generate a beneficial affect on aesthetics and visual quality.

5.8.3.4 Viewing Point 4

Viewing point 4 is on Canon Drive at the entrance to Tilden Regional Park. This viewing point is thirty yards southwest of a proposed project area TI006 and approximately 200 yards southwest of connected project area TI006, as indicated in Table 5.8-3. Actions identified for these areas focus on eucalyptus and French broom removal to support the reestablishment of oak-bay woodland. The duration of view at this viewing point is transient for drivers along the roadway. The proposed and connected actions would reduce vegetation density and expand views through the foreground to intermittent views of the ridgeline above by reducing obstruction. Expanded views of the background upslope to the ridgeline above the viewing point would not change the perception of existing landscape features for viewers given the transient nature of views from vehicles traveling through the viewing point and the similarity of a new expanded but still intermittent view of the ridgeline above. Wood chips generated from the removed trees would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed eucalyptus and French broom that would fade over time. In the short- and long-term this modification to 20% of the total project area would not dominate the expanded view from this viewing point. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 4 and associated areas, and would cause no significant adverse effects on aesthetics and visual quality.

5.8.3.5 Viewing Point 5

Viewing point 5 is the Hershell-Spillman Merry-Go-Round in Tilden Regional Park on Central Park Drive. This viewing point is in connected project area TI008b and is similar in view type and effect, to changes anticipated at three adjacent connected project areas as indicated in Table 5.8-3. Treatment actions identified for these areas focus on forest litter, debris and understory removal, which promote oak-bay woodland succession and reduce fuel loads around the merry-go-round and in the connected project areas. The duration of view at this viewing point is prolonged for recreation site users and homes up slope, and transient for drivers on Central Park Drive. Treatment activities at the project areas up slope would reduce tree canopy and vegetation density, and increase the visibility to the ridgeline by reducing visual screening. This reduced visual screening would increase the dominance of homes up slope in the user's field of view. These treatment actions would also decrease visual screening for the up slope homes of the

recreation site and associated parking lot. Wood chips generated from the removed trees would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed eucalyptus and French broom that would fade over time. In the short- and long-term this modification to 20% of the total project area would not dominate the expanded view from this viewing point. The treatment activities would also leave tree stumps and their connected underground root structures in place as an erosion control measure which would create clumps of gray stumps approximately 4 to 6 inches tall in these areas which wouldn't be anticipated to generate a distracting visual feature. Figure 5.8-2 shows a digital rendering of changes to the view up slope from the recreation site's parking lot following implementation of the connected actions.

The connected actions would reduce the visual modification class rating at viewing point 5 and associated areas, by one level to visual modification class-2 for prolonged recreation site users, given the potential for the introduction of structures that could attract the attention of viewers due to the reduced screening of up-slope homes. The connected actions would also reduce the rating by one level for adjacent residences where currently confined views of trees in the foreground would be opened to background views of the recreation site and parking lot immediately down slope. These reductions in visual modification class ratings would be a significant adverse effect, given the site's sensitivity.

5.8.3.6 Viewing Point 6

Viewing point 6 is on the Selby Trail in Tilden Regional Park, near an access point on Summit Road in Berkeley, looking east along the trail into grassland with many trees. It is in proposed project area TI012. The view type and anticipated visual impact at this viewing point are similar to those anticipated in eight other proposed and connected project areas, as indicated in Table 5.8-3. Actions identified for these areas include eucalyptus and French broom removal, hardwood tree pruning, grass mowing and/or grazing, vegetation reduction to reduce fuel volumes near trails, and debris removal. The duration of view at this viewing point is transient for hikers utilizing the trail and prolonged for residents in adjacent homes. Proposed activities in the project area where the viewing point is located and the other project areas identified in Table 5.8-3 would reduce tree canopy and vegetation density, increasing views through the foreground vegetation into the rolling hill background and the golf course down slope. The existing visual texture variation between the foreground and the background would be lessened by reduced density of trees and large shrubs. Wood chips generated from the removed trees would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed eucalyptus and French broom that would fade over time. In the short and long-term this modification to 20% of the total project area would not dominate the expanded view from this viewing point. The proposed actions on site would also include removal of large tree stumps and application of herbicide on eucalyptus sprouts to prevent reemergence. In areas where the golf course down slope becomes visible in the background, the visual effect could be adverse for

Figure 5.8-2. Viewing Point 5 Photo Simulation

prolonged viewers in adjacent residences and trail users given the introduction of a new noticeable feature in the landscape that could attract their attention. Implementation of the proposed and connected actions would reduce the visual modification class rating at viewing point 6 and associated areas by one level to visual modification class-2 for prolonged viewers in adjacent residences and trail users where currently confined views of trees would be opened to the golf course immediately down slope. This would be a significant adverse effect given the site's sensitivity.

5.8.3.7 Viewing Point 7

Viewing point 7 is on an unnamed fire road on Frowning Ridge near Grizzly Peak Road in Oakland with panoramic views to the west overlooking Berkeley and the bay down slope and the San Francisco Peninsula, Mount Tamalpais, and the Pacific Ocean out to the view horizon, and to the east with Tilden Regional Park down slope, and Contra Costa county out to the view horizon. This viewing point is adjacent to one proposed project area and one connected project area and is similar in view type and effect to changes anticipated at seven other proposed and connected project areas as indicated in Table 5.8-3. Treatment actions identified for these areas include eucalyptus removal, oak and pine tree pruning, understory shrub removal, and debris removal. The duration of view at this viewing point is transient for trail users. Treatment activities at the project areas down slope from the viewing point would reduce tree canopy and vegetation density, and increase the visibility of the bay to the west and rolling grassland hills to the east by reducing visual screening. The treatment activities would however leave tree stumps and their connected underground root structures in place as an erosion control measure which would create clumps of gray stumps approximately 4 to 6 inches tall in these areas. The distance between the viewing point and the treatment project areas, panoramic nature of the viewing point, small size of stumps left in place and transient duration of trail users would lessen the tree stumps' potential to cause visual distraction.

The treatment activities would also spread wood chips generated from the removed trees across approximately 20% of the project area at a thickness averaging between 4 and 6 inches for proposed and connected project areas managed by the EBRPD and Oakland and 8 to 12 inches with a maximum of depth 2 feet in locations managed by UCB, as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed eucalyptus and French broom that would fade over time. In the short and long-term this modification to 20% of the total project area would not dominate the expanded view from this viewing point.

Figure 5.8-3 shows a digital rendering of changes to the view west from viewing point 7 following implementation of the proposed and connected actions. Expanded views of the bay to the west could improve the perception of existing landscape features in the background for both transient and prolonged viewers. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 7 and associated areas, and would cause no significant adverse effects and could generate a beneficial effect on aesthetics and visual quality.

Figure 5.8-3. Viewing Point 7 Photo Simulation

5.8.3.8 Viewing Point 8

Viewing point 8 is on an unnamed fire road on Frowning Ridge Road in Oakland with panoramic views to the west overlooking Berkeley and the bay down slope and the San Francisco Peninsula, Mount Tamalpais, and the Pacific Ocean out to the view horizon. This viewing point is within one of the proposed project areas and is similar in view type and effect, to changes anticipated in an adjacent proposed action treatment area as indicated in Table 5.8-3. Treatment actions identified for these areas include eucalyptus removal. The duration of view at this viewing point is transient for trail users. Treatment activities at the project areas up slope from the viewing point would reduce tree canopy and vegetation density, and increase the visibility to the ridgeline by reducing visual screening. The treatment activities would however leave tree stumps and their connected underground root structures as an erosion control measure, which would create clumps of gray stumps approximately 4 to 6 inches tall in these areas. This viewing point's transient user duration and the short height of the stumps left in place would lessen the tree stumps' potential to cause visual distraction for trail users, who would have intermittent exposure to the irregularly spaced stumps. The treatment activities would also spread wood chips generated from the removed trees across approximately 20% of the project area at a thickness averaging between 8 and 12 inches with a maximum of depth 2 feet in locations managed by UCB and 4 to 6 inches for proposed and connected project areas managed by Oakland, as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed eucalyptus and French broom that would fade over time. In the short and long-term this modification to 20% of the total project area would not dominate the expanded view from this viewing point. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 8 and associated areas, and would cause no significant adverse effects on aesthetics and visual quality.

5.8.3.9 Viewing Point 9

Viewing point 9 is a turnout on Grizzly Peak Boulevard with panoramic views to the west overlooking Strawberry Canyon, Berkeley and the bay down slope and the San Francisco Peninsula, Mount Tamalpais, and the Pacific Ocean out to the view horizon. This viewing point overlooks twelve of the proposed and connected project areas as indicated in Table 5.8-3.

Actions identified for these areas include removal of eucalyptus, acacia, Monterey pine and French broom, hardwood tree pruning, wood chip placement, grass mowing and/or grazing, and debris removal. The duration of view at this viewing point varies by use, with transient views for drivers and bicycle riders on Grizzly Peak Boulevard and prolonged views for vehicles parked at the turnout. Proposed and connected actions down slope from the viewing point would reduce tree canopy and vegetation density, increase the visibility of existing fire roads by reducing visual screening, and leave tree stumps in place. The distance, ranging from 500 feet to 1.5 miles, between the viewing point and the project areas and the panoramic nature of the view would minimize the potential for these new features to attract attention that would compete with the other features visible from the viewing point. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 9 and would cause no significant adverse effects on aesthetics and visual quality.

5.8.3.10 Viewing Point 10

Viewing point 10 is at a trailhead for an unnamed fire road on Claremont Avenue. This viewing point is in the Claremont-PDM proposed project area. The proposed action in this area would remove all eucalyptus trees to allow the forest to convert back to one dominated by native tree species. The duration of view at this viewing point is transient for trail users and drivers on Claremont Avenue. The proposed action up slope from the viewing point would reduce tree canopy and vegetation density, and increase the visibility to the ridgeline by reducing visual screening. The proposed action would leave tree stumps and their connected underground root structures in place as an erosion control measure which would create clumps of gray stumps approximately 4 to 6 inches tall in these areas. These stumps would however benefit from some visual blending with existing native tree and shrub species visible from the viewing point. During implementation of the proposed action, wood chips generated from the removed trees would be spread across approximately 20% of the project area at a thickness averaging between 8 and 12 inches with a maximum of 2 feet in some locations as an additional erosion control measure. Figure 5.8-4 shows a digital rendering of changes to the view up slope from approximately 100 yards west of viewing point 10 following implementation of the proposed and connected actions. The changes proposed at viewing point 10 would not introduce any new landscape features that would compete for attention with the existing landscape features or that would be visually distracting. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 10 and associated areas, and would cause no significant adverse effects on aesthetics and visual quality.

5.8.3.11 Viewing Point 11

Viewing point 11 is in a residential area off Stonewall Road in Berkeley, at a trailhead for the Stonewall-Panoramic Trail at the western edge of the Claremont Canyon Regional Preserve. This viewing point is adjacent to one proposed project area and one connected project area and is similar in view type and effect to changes anticipated at seven other proposed and connected project areas as indicated in Table 5.8-3. Treatment actions identified for these areas include eucalyptus, acacia, Monterey pine and French broom removal, hardwood tree pruning, grass mowing and/or grazing, and debris removal. The duration of view at this viewing point is prolonged for residents in adjacent homes and transient for trail users. Treatment activities at the project areas up slope from the viewing point would reduce tree canopy and vegetation density, and increase the visibility to the ridgeline by reducing visual screening. Increased sightlines to the ridgeline upslope of the viewing point would not introduce any new landscape features that would compete for attention with the existing landscape features or that would be visually distracting given the similarity of the vegetation composition along the ridgeline to other grassland areas in the background view. Wood chips generated from the removed trees would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed eucalyptus and French broom that would fade over time. In the short- and long-term this modification to 20% of the total project area would not dominate the expanded view from this viewing point. The treatment activities would also leave tree stumps and their connected underground root structures

Figure 5.8-4. Viewing Point 10 Photo Simulation

in place as an erosion control measure which would create clumps of gray stumps approximately 4 to 6 inches tall on the hill slope which wouldn't be anticipated to generate a distracting visual feature given their short height. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 11 and associated areas, and would cause no significant adverse effects on aesthetics and visual quality.

5.8.3.12 Viewing Point 12

Viewing point 12 is a turnout on Grizzly Peak Boulevard that overlooks several proposed and connected project areas and is close to seven project areas that offer similar views, as indicated in Table 5.8-3. Treatment actions identified for these areas include eucalyptus, French broom and Monterey pine removal, oak and pine tree pruning, understory shrub removal, and debris removal. The duration of view at this viewing point is transient for road users but prolonged for homes along Grizzly Peak Boulevard. Treatment activities at the project areas down slope from the viewing point would reduce tree canopy and vegetation density, and increase the visibility of the bay to the west and rolling grassland hills to the east by reducing visual screening. The existing visual texture variation between the foreground and the background would be lessened by reduced vegetation density including trees and large shrubs.

Wood chips generated from the removed trees would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed vegetation that would fade over time. The treatment activities would also leave irregularly spaced clumps of gray tree stumps approximately 4 to 6 inches tall on the hill slope. Exposure to these wood chips and stumps in the foreground to midground could cause some viewer distraction for prolonged viewers in adjacent residences, but given the panoramic views of the bay and city below in the background the stumps would not be expected to become a focal point. Expanded views of the bay to the west and grasslands to the east could improve the perception of existing landscape features in the background for both transient and prolonged viewers. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 12 and associated areas, and would cause no significant adverse effects and could generate a beneficial effect on aesthetics and visual quality.

5.8.3.13 Viewing Point 13

Viewing point 13 is in the Sibley Volcanic Regional Preserve at the trailhead for the Volcano Trail. This viewing point is within one of the proposed project areas and is similar in view type and effect to changes anticipated at six other proposed and connected project areas as indicated in Table 5.8-3. Actions identified for these areas focus on non-manzanita shrub removal, eucalyptus tree removal and thinning, and debris removal. The duration of view at this viewing point is transient for trail users. The proposed action would reduce vegetation density and expand views through the foreground to intermittent views of the rolling grassland background by reducing obstruction. Wood chips generated from the removed trees would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed vegetation that would fade over time.

Expanded views of rolling grasslands in the background could improve the perception of existing landscape features in the background for transient viewers. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 13 and associated areas, and would cause no significant adverse effects and could generate a beneficial effect on aesthetics and visual quality.

5.8.3.14 Viewing Point 14

Viewing point 14 is at the Burton Road access point to Redwood Regional Park in proposed project area RD004, and is similar in view type and effect, to changes anticipated at two other proposed and connected project areas as indicated in Table 5.8-3. Actions identified for these areas focus on shrub removal below existing hardwoods, pines and eucalyptus, dead or unhealthy tree removal, and debris removal. The duration of view at this viewing point is transient for trail users and prolonged for residents. The proposed and connected actions would reduce vegetation density and expand views through the foreground to the distant rolling grassland background on the horizon to the east. Wood chips generated from the removed trees would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed vegetation that would fade over time. Expanded views of the distant rolling grassland background on the horizon to the east could improve the perception of existing landscape features in the background for both transient and prolonged viewers. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 14 and associated areas, and would cause no significant adverse effects and could generate a beneficial effect on aesthetics and visual quality.

5.8.3.15 Viewing Point 15

Viewing point 15 is in Redwood Regional Park on the West Ridge Trail in proposed project area RD004 and is similar in view type and effect, to changes anticipated at four other proposed and connected project areas, as indicated in Table 5.8-3. The visible project areas include a pine forest stand adjacent to the Chabot Space and Science Center. Actions identified for these areas focus on shrub removal below existing hardwoods, pines, and eucalyptus; eucalyptus and pine tree removal; dead or unhealthy tree removal; and debris removal. The duration of view at this viewing point is transient for trail users. The proposed and connected actions would reduce vegetation density and expand views through the foreground to the distant rolling grassland background on the horizon to the east. Wood chips generated from the removed trees would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed vegetation that would fade over time. Expanded views of the distant rolling grassland background on the horizon to the east could improve the perception of existing landscape features in the background for both transient and prolonged viewers. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 15 and associated areas, and would cause no significant adverse effects and could generate a beneficial effect on aesthetics and visual quality.

5.8.3.16 Viewing Point 16

Viewing point 16 is in Redwood Regional Park at the intersection of the Golden Spike Trail and the Tate Trail. This viewing point is at the eastern edge of proposed project area RD009, and is similar in view type and effect, to changes anticipated in adjacent connected project area RD009, as indicated in Table 5.8-3. Actions identified for these areas include eucalyptus removal, grass mowing and/or grazing, and debris removal. The duration of view at this viewing point is transient for trail users. Proposed and connected actions north and west of this viewing point would reduce tree canopy and vegetation density in and around the Piedmont Stables. Additionally, wood chips generated from the removed trees would be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure.

These treatment actions would open vegetation in the foreground, increasing background views, including those of the stables. Structures at the stables and horse exercise areas do not conflict or contrast in color or texture with the area's natural setting. The removal of vegetative screening and the opening of sightlines to include the Piedmont Stables would not introduce landscape feature changes that would compete for viewer attention with other existing landscape features in view given the stables conforming color and texture. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 16 and associated areas, and would cause no significant adverse effects on aesthetics and visual quality.

5.8.3.17 Viewing Point 17

Viewing point 17 is on the Goldenrod Trail east of Skyline Boulevard. This viewing point is in proposed project area AC006 and is similar in view type and effect, to changes anticipated in connected project area AC006. Actions identified for these areas focus on removal of ladder fuels in oak-bay woodland and removal of eucalyptus to reduce fuel loads. Wood chips generated from the removed vegetation would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed vegetation that would fade over time. The duration of view at this viewing point is transient for trail users and prolonged for homes on the western edge of the treatment area. The proposed and connected actions would reduce tree canopy and vegetation density. This would open vegetation in the foreground, increasing background views, including views of homes west of the viewing point and prolonged views of rolling grasslands east of the treatment area for viewers in the homes. Views for trail users would not differ significantly with implementation of the proposed and connected actions, given that the homes in the background are currently only partially screened by vegetation and the trail user's exposure to views of these homes would remain intermittent. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 17 and associated areas, and would cause no significant adverse effects on aesthetics and visual quality.

5.8.3.18 Viewing Point 18

Viewing point 18 is on the Goldenrod Trail north of the Chabot Equestrian Center in Anthony Chabot Regional Park. This viewing point is north of AC007. Treatment actions identified for these areas focus on removal of ladder fuels in oak-bay woodland and removal of eucalyptus to reduce fuel loads. Wood chips generated from the removed vegetation would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed vegetation that would fade over time. The duration of view at this viewing point is transient for trail users. Treatment activities in the project areas identified in Table 5.8-3 would reduce tree canopy and vegetation density in and around the equestrian center. These treatment actions would open vegetation in the foreground increasing background views, including those of the stables and distant rolling grassland on the horizon to the east. Structures at the stables and horse exercise areas do not conflict or contrast in color or texture with the area's natural setting. The removal of vegetative screening and the opening of sightlines to include the Chabot Equestrian Center would not introduce landscape feature changes that would compete for viewer attention with other existing landscape features in view given the stables conforming color and texture. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 18 and associated areas, and would cause no significant adverse effects on aesthetics and visual quality.

5.8.3.19 Viewing Point 19

Viewing point 19 is on Skyline Boulevard in Oakland at the western edge of connected project area AC007 overlooking Anthony Chabot Regional Park. Actions identified for this area focus on removal of ladder fuels in oak-bay woodland and removal of eucalyptus to reduce fuel loads. Wood chips generated from the removed vegetation would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed vegetation that would fade over time. The duration of view at this viewing point is transient for drivers, bicyclists, and walkers along Skyline Boulevard. The connected actions would reduce vegetation density and expand views through the foreground to views of the rolling grasslands in the background. Expanded views of the distant rolling grassland background on the horizon to the east could improve the perception of existing landscape features in the background for both transient and prolonged viewers. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 19 and associated areas, and would cause no significant adverse effects and could generate a beneficial effect on aesthetics and visual quality.

5.8.3.20 Viewing Point 20

Viewing point 20 is in the parking lot of the Lake Chabot Golf Course club house in Oakland. This viewing point provides a view of four of the proposed and connected project areas across Chabot Lake as indicated in Table 5.8-3. Actions identified for these areas include eucalyptus removal, grass mowing and/or grazing, and debris removal. Wood chips generated from the removed vegetation would also be spread across approximately 20% of the project area at a

thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed vegetation that would fade over time. The duration of view at this viewing point is transient for recreators. Proposed and connected actions across the lake from the viewing point would reduce tree canopy and vegetation density, but given the distance between the viewing point and the proposed and connected project areas, this would not cause perceptable changes in the form or texture of the view. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 20 and associated areas, and would cause no significant adverse effects on aesthetics and visual quality.

5.8.3.21 Viewing Point 21

Viewing point 21 is at a parking lot pull out above Lake Chabot in the Anthony Chabot Regional Park. This viewing point is between proposed project area AC013 and connected project area AC013. The view type and anticipated visual impacts are similar to those at two other proposed project areas, as indicated in Table 5.8-3. Actions identified for these areas include eucalyptus removal, grass mowing and/or grazing, and debris removal. Wood chips generated from the removed vegetation would also be spread across approximately 20% of the project area at a thickness averaging between 4 and 6 inches as an additional erosion control measure. These wood chips would introduce a new surface texture and color in areas where they are placed to replace removed vegetation that would fade over time. The duration of view at this viewing point is transient for recreators and prolonged for residents in nearby homes. Treatment activities in the project area where the viewing point is located and the similar project areas identified in Table 5.8-3 would reduce tree canopy and vegetation density increasing views through the foreground vegetation into the rolling hills in the background and Chabot Lake down slope. Expanded views of the rolling hills in the background and Chabot Lake down slope could improve the perception of existing landscape features in the background for both transient and prolonged viewers. Implementation of the proposed and connected actions would not reduce the visual modification class rating at viewing point 21 and associated areas, and would cause no significant adverse effects and could generate a beneficial effect on aesthetics and visual quality.

5.8.3.22 Summary of the Effects of the Proposed and Connected Actions on Aesthetics and Visual Quality

Table 5.8-4 summarizes the effects of the proposed and connected actions at the two viewing points where the potential for significant adverse impacts were identified. The proposed and connected actions would not cause significant impacts at the other 19 viewing points analyzed in this section.

Table 5.8-4. Effect of Proposed and Connected Actions on Aesthetics and Visual Quality

Viewing Point ID	Public Sensitivity	Existing Visual Modification Class	Projected Visual Modification Class	Intensity of Effect	Relevant Project Areas
5	High	1	2	Significant, adverse	TI008a, TI008b, TI009, TI010
6	High	1	2	Significant, adverse	TI011, TI012, TI013, TI014,TI015,TI016, TI019, TI020, TI021

5.8.4 Avoidance and Mitigation Measures

Avoidance and mitigation of adverse effects associated with the proposed and connected action and the no action alternative considered in this EIS have been incorporated as components when possible. Instances of significant adverse effects that cannot be avoided or mitigated involve changes to prolonged views from homes and recreation sites caused by removal of vegetation, which would reduce existing visual screening and introduce new forms of visual distraction that would compete for attention with existing features in view. Mitigation for these changes was determined to be infeasible given the need to achieve fuel reduction in the study area.

5.9 Socioeconomics

This section discusses the potential effects of the proposed and connected actions and the no action alternative on community character, residential property values, growth, and environmental justice populations in and near the project areas.

5.9.1 Community Character

Community character refers to the aesthetic look and the overall feel of a community. The communities adjacent to the proposed and connected project areas are described in Section 4.10.5.

5.9.1.1 No Action Alternative

Under the no action alternative, vegetation adjacent to communities would not change significantly in the absence of a wildfire. Therefore, in the absence of a wildfire, the no action alternative would have no effect on community character. Under the no action alternative, it is likely that wildfires would do more damage than under the proposed and connected actions. A wildfire could have a devastating impact on community character.

5.9.1.2 Proposed and Connected Actions

Under the proposed and connected actions, existing community character could be affected by removing vegetation within or directly adjacent to the communities described in Section 4.10.5. Many of these communities are single-family residential neighborhoods bordering park and open space areas. The aesthetic and recreational appeal of the parks and open spaces is an important element of the character of these communities. In most of the proposed and connected project areas, only a portion of the trees would be cut, and this would not have a significant aesthetic impact. Significant impacts could occur in communities adjacent to areas where complete removal of eucalyptus, Monterey Pine, and acacia trees is proposed. Aesthetic impact significant enough to alter community character could occur in neighborhoods in the following locations:

- In Berkeley near Grizzly Peak Boulevard and Summit Road at the northwestern corner of the proposed Strawberry Canyon-PDM project area (The proposed cutting of all eucalyptus trees between a residential community and the UCB Space Sciences Laboratory would make the homes feel closer to the laboratory complex.)
- In Oakland in the portion of the Glen Highlands area immediately southeast of the proposed Caldecott Tunnel-PDM project area (Much of the eucalyptus forest the neighborhood overlooks would be cut down.)

The effect of the proposed project on the character of these communities would decrease as native species replaced the non-native trees cut down.

The proposed and connected actions would reduce the likelihood that a wildfire would have a devastating effect on community character.

5.9.1.3 Mitigation Measures

No mitigation measures are specified for impacts to community character.

5.9.2 Residential Property Values

A literature review was conducted to qualitatively evaluate the potential effects of the proposed and connected actions on residential property values through changes in community character and reduction of hazardous fire risk, see Appendix H. No quantitative (i.e., dollar value) estimates of changes in residential property values were calculated.

The literature review of the effect of wildfire on residential property values indicates the following:

- House prices decline with increased knowledge of fire risk, but this impact decreases as the time since the last fire increases (Donovan et al. 2007).
- Risk perception and the decreased value of trees as an amenity can lead to an approximately 15% decrease in home values in an unburned community near a burned area (Loomis 2004).
- House sale prices within 5 kilometers (km) of a fire burned area were 13.7% ($33,232) lower than equivalent homes at least 20 km from a fire. The authors found no price recovery within the 7 years of data used (Stetler et al. 2010).
- Risk of fire by itself is not always enough to reduce local property values. When risk is combined with proximity to a recent major fire (greater than 300 acres), however, property values decreased. The authors found that within 5 km of a major fire, house prices fell 5% (Troy and Romm 2007).

5.9.2.1 No Action Alternative

Under the no action alternative, wildfire hazard in and near the proposed and connected project areas would not be reduced. The current level of wildfire hazard can be a threat to property values.

Overall, the literature on wildfires and property values indicates that the sale price and value of property decline in response to direct fire exposure and property damage as well as from proximity to and views of burned areas. Knowledge of risk of fire combined with proximity to a recent fire also decreases property prices. Some of the articles found that the values return over a relatively short time (Donovan et al. 2007, Stetler et al. 2010, and Troy and Romm 2007).

Under the no action alternative, much less would be done to mitigate the potential negative impacts of wildfires and the perceived threat of fire on property values in and near the proposed and connected project areas. Under the no action alternative, property values in the proposed and connected project areas could be negatively impacted through the continued risk of and negative perception associated with nearby hazardous fires.

5.9.2.2 Proposed and Connected Actions

Under the proposed and connected actions, non-native vegetation, such as eucalyptus, Monterey pine, and acacia trees, would be cut down. Trees generally add value as amenities in residential areas (Loomis 2004). In most of the proposed and connected project areas, vegetation removal adjacent to communities would be limited to thinning and pruning, which is unlikely to have a

significant impact on property values. Significant impacts could occur in communities adjacent to areas where complete removal of eucalyptus, Monterey Pine, and acacia trees is proposed. Significant adverse impacts on property values could occur in the two communities listed in Section 5.9.1.2. The effect of the proposed action on property values in these communities could decrease as native species replace the non-native trees removed.

Removal of non-native vegetation would also reduce the potential for hazardous fire risk throughout the proposed and connected project areas. Reducing the potential for fire would in turn reduce the negative perception associated with nearby hazardous fire risk (Donovan et al. 2007, Stetler et al. 2010, and Troy and Romm 2007). Under the proposed and connected action, reducing the risk for and negative perception of nearby fires could have a beneficial impact on property values.

5.9.2.3 Mitigation Measures

No mitigation measures are specified for impacts to property values.

5.9.3 Induced Growth

The proposed and connected actions and the no action alternative could induce growth if they stimulated construction of new housing, businesses, or recreational facilities and associated infrastructure. Under the no action alternative, existing conditions would not change significantly, and no stimulation of growth would occur. By reducing hazardous fire risk, the proposed and connected actions could make property close to the project areas more attractive to developers, but the effect is unlikely to be significant. Neither alternative would be likely to induce growth.

5.9.4 Environmental Justice

Environmental justice is an issue when an action could have a disproportionately high and adverse effect on a minority or low-income population. Environmental justice is not an issue if an action would have similar effects on minority and nonminority people and high- and low-income people, even if the effects are high and adverse.

Impacts to community character can be an environmental justice issue if the impact falls disproportionately on a minority or low-income community. As noted in Section 5.9.1.2, aesthetic impact significant enough to alter community character could occur in two areas. These areas and the census block groups that contain them are:

- Near Grizzly Peak Boulevard and Summit Road at the northwestern corner of the Strawberry Canyon-PDM proposed project area—Alameda County census tract 4216
- The Glen Highlands area south of the Caldecott Tunnel-PDM proposed project area—Alameda County census tract 4044

As shown in Table 4.10-11 in Section 4.10, neither of these block groups meets the criteria for an environmental justice population in Section 4.10.2.4.

The proposed and connected actions for minority and nonminority people and for high- and low-income people would not have disproportionately high and adverse effects on a minority or low-income population.

5.10 Human Health and Safety

This section summarizes potential impacts to human health and safety from implementation of the proposed and connected actions and the alternatives. The analysis was conducted following the general methodology described in Section 4.11.2 and is divided into two primary issues: potential impacts of activities involving hazardous substances other than pesticides, and potential impacts of application of pesticides. The analysis of these issues is supported by two appendices: Appendix G, Existing Contamination and Locations of Water Wells Inside and Surrounding Project Areas, and Appendix F, Screening Level Human Health and Ecological Risk Evaluation.

Due to the complexity of some issues and their relevance to other areas of analysis, some potential health and safety impacts are described in other sections. The impacts of the proposed and connected actions and the alternatives on hazardous fire risk are analyzed in Section 5.2. Water quality impacts are discussed in Section 5.4. Air quality impacts are discussed in Section 5.5.

Based on NEPA regulations at 40 CFR § 1508.27, impacts to human health and safety may be significant if they would:

- Include release of hazardous or toxic substances that would significantly affect workers or the public through transport, use, or disposal of hazardous materials or through reasonably foreseeable accidents involving release of hazardous materials into the environment
- Involve uncertain environmental effects or highly unique environmental risks to workers or the public that are likely to be significant
- Fail to comply with applicable federal, state, and local statutes and regulations

The following sections discuss the potential impacts of proposed and connected actions and the alternatives with respect to these issues.

5.10.1 No Action Alternative

Under the no action alternative, described in Section 3.4.1, it is likely that each subapplicant would continue certain basic vegetation management activities to attempt to control fire risk in high hazard areas.

Implementation of these activities would be mostly short term. Applicable public health and safety plans and best management practices, such as those currently used for these activities, would be applied to ensure workers and the public were not adversely affected during these vegetation management activities. In addition, these activities would not disturb any of the contaminated soil or groundwater sites identified in Section 4.11.3.2. There would be no change in impact to public health and safety from these ongoing vegetation management activities.

Under the no action alternative, although the subapplicants would continue certain basic vegetation management activities to attempt to control fire risk in high hazard areas, they would not be able to carry out the proposed and connected actions as scoped. Although this inaction would not impact the public in the short term because conditions (although hazardous) would be the same as currently experienced, in the long term, it would result in increasing the hazardous

fire risk for the proposed and connected project areas and surrounding region. Thus, there would be a significant adverse impact to public health and safety from this inaction.

The no action alternative would comply with applicable federal, state, and local statutes and regulations (described in Section 4.11.1).

5.10.2 Proposed and Connected Actions

The following subsections discuss the impacts of the proposed and connected actions from vegetation removal and processing, burning vegetative material, and herbicide application.

5.10.2.1 Impacts During Vegetation Removal and Processing

5.10.2.1.1 Accidental Spills

Mechanical removal of non-native trees would involve heavy-duty diesel trucks used to haul equipment to the project areas and vegetative material away from the project areas; equipment used to create access roads on several of the sites; and equipment used to cut and process vegetation, including feller-bunchers, skidders, chippers, chainsaws, and air compressors. In addition, workers would travel to and from the work sites in vehicles. These vehicles and logging equipment require diesel and gasoline fuels, hydraulic oil, and other hazardous materials that could be accidentally released through spills during material handling, fueling, and equipment repair.

To address the potential for releases from vehicles and equipment, as part of the project, the contractor would be required to prepare and implement a worker health and safety plan prior to the start of vegetation management activities per Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 1926), and requirements of the site-specific project specifications. The plan would require documentation that all workers have reviewed and signed the plan.

In addition, the proposed and connected actions include implementation of best management practices in compliance with applicable regulations for storage, use, and disposal of hazardous materials. For example, all vegetation management workers would be provided with training and oversight to ensure they are familiar with safety requirements, equipment use, and site-specific conditions, including topography. They would be taught proper procedures for handling fuels and lubricants so that spilling and runoff of these substances does not occur. In addition, they would be required to use OSHA-compliant equipment, including personal protection equipment and hand tools. All project activities would be conducted in compliance with state and federal OSHA standards.

With these measures as part of the proposed and connected actions, accidental release of hazardous materials would not be significant.

5.10.2.1.2 Toxic Air Emissions

In addition, vehicles and logging equipment would result in increased air emissions that could impact local air quality. Section 5.5, Air Quality, discusses impacts from vehicle fuel use during implementation and maintenance of the proposed and connected actions.

5.10.2.1.3 Release of Hazardous Materials from Existing Contaminated Sites

As discussed in Section 4.11.3.2, a number of sites with known soil or groundwater contamination have been identified within the vicinity of the proposed and connected project areas (Appendix G, Existing Contamination and Locations of Water Wells Inside and Surrounding Treatment Units). In each case the site has been closed, the contamination is not likely to migrate onto the proposed and connected project areas, or the remedial actions on the site would not be impacted by the vegetation management activities. The proposed and connected actions would not have a significant effect on any contaminated site, and the contaminated sites are unlikely to have a significant effect on the proposed and connected actions.

5.10.2.1.4 Potential Electrical Hazards

Because of the proximity of the proposed and connected project areas to homes and other structures that use electricity, vegetation may need to be removed near power lines. Electricity can arc across an air gap from a high voltage line to a nearby tree, resulting in grounding of the circuit through the tree. Hazards arise not only from electric shock but also from the potential for starting fires. Under the proposed and connected actions, National Electrical Safety Code 2012 Edition (NESC 2012) guidelines would be followed regarding how close a worker can come to energized lines and how a tree should be removed or trimmed, taking into account tree growth, movement of the tree and conductors in wind, voltage, and sagging of the conductor at high temperatures.

5.10.2.1.5 Proximity of Vegetation Management Activities to Public Areas

The proposed and connected project areas are in parklands that are frequented by recreational visitors. Mechanical vegetation management activities can potentially harm humans through exposure to sharp tools, machinery and heavy equipment, risk of physical harm from tree felling and topping, and increased traffic on unimproved roads.

To reduce the potential for contact between recreational visitors and vegetation management activities, the subapplicants would provide informational signing for project areas as well as post notifications of closed trails and campgrounds prior to vegetation management activities. In addition, contracting flaggers and conducting road maintenance activities (e.g., clearing brush from roadsides for increased visibility) also would reduce the potential for recreational visitors to be present during vegetation management activities.

Burning Vegetative Material

For some proposed and connected project areas, EBRPD indicated that pile burning or broadcast burning was an alternative to removing the trees, limbs, and brush by mechanical means and off-hauling by truck. Both of these burning methods would reduce local air quality and adversely affect health and safety for workers and the public in the vicinity.

No overall toxicity value is assigned for smoke because the components of smoke vary widely depending on the fuel for the fire and the concentration of the smoke. Some common combustion products of smoke from wildland fires that are known irritants or carcinogens include particulate matter, polycyclic aromatic hydrocarbons (PAHs), carbon monoxide, aldehydes, semivolatile and volatile organic compounds, and ozone (U.S. Department of Agriculture [USDA] 1997). Health effects from exposure to these substances are briefly described below:

- Particulate matter consists of solid and liquid particles of dust, soot, aerosols, and other matter small enough to remain suspended in the air for a long period of time. Exposure to particulate matter can aggravate existing respiratory conditions, increase respiratory symptoms and disease, decrease long-term lung function, and possibly cause premature death. Some populations are more sensitive to the negative effects of particulate matter in the air, such as the elderly, individuals with cardiopulmonary disease, and children. Particulate matter in the air can also cause a reduction of visibility.
- PAHs are a class of more than 100 different organic compounds that are formed during incomplete combustion. Toxicity criteria have been developed for this group of chemicals based on animal studies. Individual PAHs, such as benzo[a]pyrene and mixtures containing various PAHs, have been determined to be carcinogenic to humans and animals.
- Carbon monoxide (CO) is an odorless, colorless gas formed by the incomplete combustion of fuels. At high concentrations, CO reduces the amount of oxygen in the blood, causing heart difficulties in people with chronic diseases, reduced lung capacity, and impaired mental abilities.
- Aldehydes comprise a group of compounds that can be severely irritating to mucous membranes. Commonly detected aldehydes resulting from incomplete combustion include acrolein and formaldehyde. Acute exposures to acrolein typically result in mild irritation of eyes and mucous membranes. Acute exposures to formaldehyde may result in irritation to the eye and respiratory system and potentially adverse effects to the immune system.
- Semivolatile and volatile organic compounds occur in wildland fires in widely varying concentrations. Common volatile organic compounds include benzene, naphthalene, and toluene. Benzene is a natural emission of forest fires. Breathing high concentrations of benzene can cause drowsiness, dizziness, headaches, tremors, rapid heart rate, confusion, unconsciousness, and even death. Long-term exposure can cause anemia and leukemia.
- Ozone is formed in the atmosphere from volatile organic compounds and nitrogen oxides rather than being directly emitted from pollutant sources. It can damage lung tissue, reduce lung function, and can cause health effects, such as chest discomfort, coughing, nausea, respiratory tract and eye irritation, and decreased pulmonary function.

Firefighters and workers conducting the burning would be at the greatest risk of exposure to airborne toxins from prescribed fires or wildfires. Recreational visitors to the parks and residents downwind of the prescribed fires would also be exposed to a lesser extent. Sensitive populations who suffer from breathing ailments may be more susceptible to the smoke particularly if atmospheric conditions do not disperse the smoke.

To reduce worker exposure to smoke, the subapplicants would comply with state and federal OSHA standards with regard to exposure to hazardous materials in the workplace. Measures may include rotation of workers in and out of the smoke zone and the use of respirators to reduce short-term and long-term exposure levels.

To reduce public exposure to smoke, the subapplicants would follow Smoke Management Guidelines for Agricultural and Prescribed Burning per Title 17 of the California Code of Regulations Subchapter 2. These guidelines include procedures for public notification and education, such as providing press releases to local media to inform the public of the prescribed burn, posting appropriate signage at burn sites (at a minimum, along highways and major roadways in advance of areas where smoke would be visible or could potentially pose a visibility concern), and providing a means by which the public can report smoke complaints. Adherence to these guidelines would reduce public exposure to smoke.

In addition, the subapplicants would include in their smoke management plans the requirements for regularly scheduled trained patrols to monitor the highways and major roadways during both daylight and nighttime hours for potential visibility issues during and following prescribed burn periods. The workers conducting the burn would also have an escape fire contingency plan that would identify suppression actions that should be applied if one or more of the following conditions exist:

- People, facilities, or personal property are threatened by the prescribed fire.
- Fire threatens to spread beyond prescribed boundaries.
- The burn is of a higher intensity than desirable and/or would result in unacceptable tree mortality, scorch, or other resource damages.
- Smoke poses an unacceptable hazard or nuisance.

5.10.2.3 Impacts from Herbicide Application

The proposed and connected actions have the potential to impact human health through exposure from application of herbicides to prevent resprouting. Appendix F, Screening Level Human Health and Ecological Risk Evaluation, provides a screening level human health and ecological risk assessment that evaluates the herbicides proposed for use, potential receptors (those who might be exposed), potential exposure pathways, toxicity information, and estimated risk characterization. The evaluation used USDA Forest Service risk assessment worksheets available online at http://www.fs.fed.us/foresthealth/pesticide/worksheets.shtml to assess exposures to human and ecological receptors. These spreadsheets were used to evaluate exposure scenarios relevant to the proposed and connected actions using site-specific parameters as much as possible to estimate exposure point concentrations and hazards for human and ecological receptors. The human health risk assessment results are summarized in this section while the ecological risk assessment results are summarized in Section 5.1, Biological Resources. Details of the risk assessment methodology and calculations are provided in Appendix F.

The risk assessment evaluates whether use of the identified herbicides in the proposed and connected actions or the alternatives would result in an unacceptable risk to human populations. None of the herbicides proposed for use in this project were identified as carcinogens; therefore, only noncancer hazards were evaluated. Noncancer hazards are quantified as the ratio of

exposure to toxicity. This ratio, referred to as a hazard quotient, assumes that some level of exposure exists below which even sensitive populations are unlikely to experience significant adverse effects. Hazard quotients below 1 suggest acceptable risk while hazard quotients equal to or exceeding 1 may suggest unacceptable risk. Higher hazard quotients may or may not indicate more severe effects but typically do indicate a greater likelihood of adverse effects occurring. This threshold of 1 was used in the determination as to whether the proposed and connected actions or the alternatives would result in an unacceptable risk to human populations.

The screening level human health risk assessment followed state and federal guidance for performance of risk assessments and was conducted in four steps as defined in Cal/EPA and EPA guidance[1] consisting of selection of chemicals of concern, exposure assessment, toxicity assessment, and risk characterization. These steps are summarized below.

5.10.2.3.1 Selection of Chemicals of Concern

The screening level human health risk assessment evaluated the four herbicides being considered for use in the proposed and connected project areas: Garlon 4 Ultra, Garlon 3A, Stalker, and Roundup. Metabolites of these herbicides were also evaluated in the risk assessment. Descriptions of the commercial formulations, active ingredients of commercial products, and properties associated with fate and transport of the herbicides are discussed in Section 2.1.2 of Appendix F.

5.10.2.3.2 Exposure Assessment

Land use in the vicinity of the proposed and connected project areas includes recreational, residential, commercial, and industrial uses. The proposed and connected project areas are in regional parks and other open space areas used for recreation. Visitors and campers in these areas could be exposed to herbicides directly during application and indirectly after application. In addition, because residential neighborhoods are adjacent to the parks and open space, residents could also be exposed to herbicides directly during application and indirectly after application if herbicides migrate from the original application area. Because a university, a high school, three elementary schools, and a preschool are also close to project areas, students of all ages have the potential to be exposed. In addition, several hospitals are located in the project vicinity although it is unlikely sensitive individuals at these facilities could be exposed. Workers could be exposed to herbicides while mixing, loading, or applying herbicides and when entering a treated site.

In the screening level human health risk assessment, exposure for the following populations was evaluated:

- Current and future herbicide handlers and vegetation management workers
- Current and future onsite recreational visitors (adult and child)
- Current and future offsite residents (adult and child)

[1] U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Risk Assessment Guidance for Superfund, Vol. I, Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December, 1989

An exposure pathway consists of four parts:

- A source and mechanism of release of chemicals to the environment
- A transport mechanism for movement of chemicals to a point of human contact (exposure point)
- An exposure point (the point of potential contact between receptor and medium)
- An exposure route (e.g., inhalation, ingestion, dermal contact)

If any of these elements of an exposure pathway is absent, no exposure can take place, and the pathway is considered incomplete. In addition, some exposure pathways that may be complete may result in little or negligible exposure. Thus, numerous possibly complete exposure pathways exist for receptors at or near the proposed and connected project areas, but most are anticipated to make minimal to negligible contribution to total hazards. Normally, in risk assessments, incomplete pathways and potentially complete pathways that are unlikely to contribute significantly to overall exposure are not evaluated. However, for this risk assessment, exposure pathways that may be incomplete or insignificant were evaluated to provide a worst-case analysis of exposure associated with improper use or application of herbicides.

Exposure routes for identified receptors include ingestion, dermal contact, and inhalation of contaminated media. Pathways of exposure may involve direct contact with herbicides in spray, soil, and vegetation and, though unlikely, via indirect contact by way of ingestion of surface water or contaminated fruits.

People could also be exposed to contaminants in smoke during burning of vegetation or during accidental fires that could occur during the proposed and connected actions. Burning of vegetation treated with herbicides is not planned; therefore, exposure to herbicides in smoke is unlikely to occur. The effects on air quality of burning vegetation as part of the proposed and connected actions are discussed in Section 5.5, Air Quality.

To avoid underestimating human exposure to a chemical, risk assessments typically look at the range of possible exposures. Some individuals may have a high degree of contact for an extended time (for example, herbicide applicators). Other individuals may have a lower degree of contact for a shorter time (for example, visitors entering a treated area). Exposure of the general public to herbicides as a result of vegetation management activities is unpredictable; therefore, the risk assessment evaluated a maximum exposed recreational visitor and resident to characterize an extreme but still plausible upper limit on exposure. In addition to this maximum exposed individual value, a central tendency assessment provides a measure of typical exposures that could occur and an estimate that defines the lower range of exposures as well. Exposure assumptions for all receptors and scenarios are provided in the USDA Forest Service worksheets in Appendix F.

5.10.2.3.3 Toxicity Assessment

In accordance with the Federal Insecticide, Fungicide, and Rodenticide Act, EPA evaluates all herbicides and other pesticides sold or distributed in the United States to determine whether they can be used without posing unreasonable risks to people or the environment. Under the act, pesticides must be registered. The registration process requires extensive scientific research and supporting test data as part of its pesticide review to assess risks to human health, domestic animals, wildlife, plants, groundwater, and beneficial insects and to assess the potential for other environmental effects.

A significant body of published work is available related to federal- and state-approved pesticides, especially those that are commonly used. Key information sources were reviewed to narrow down the list to studies from reputable sources and risk assessments that are both current and applicable to the conditions of the East Bay Hills. The published literature was used to the extent it is relevant and useful and was supplemented by more project-specific evaluation.

Toxicity values that were used in the screening level human health risk assessment were obtained from Cal/EPA to the extent available. Toxicity values not available from Cal/EPA were obtained from EPA's online Integrated Risk Information System database or other toxicological sources according to a hierarchy established in the Office of Solid Waste and Emergency Response directive 9285.7-53 (EPA 2003). Additional information concerning the toxicity of each herbicide is provided in Section 4 of Appendix F.

5.10.2.3.4 Risk Characterization

Exposures for workers (e.g., herbicide handlers) and members of the general public (e.g., residents, recreational visitors) were evaluated in the risk assessment. For each group, two exposure scenarios were taken into consideration: general exposure (normal use) and exposure after accidental releases or improper herbicide use or application (e.g., a spill of herbicide mixture or direct spray of workers or other individuals). Hazards were estimated using a range of possible application rates for the proposed herbicides to address general exposure. Accidental exposure was addressed using conservative (i.e., likely overestimated) volumes of herbicide mixtures spilled during an accidental release or accidentally sprayed onto receptors. The resulting hazards for workers before and after mitigation are presented in Table 5.10-1 and for the general public in Table 5.10-2.

Workers

As shown in Table 5.10-1, before mitigation, the worker exposure pathways that result in hazard quotients at or above the level of concern are accidental acute exposure from wearing gloves heavily contaminated by triclyopyr BEE for 1 hour (hazard quotients ranges from 2 to 6) and chronic general exposure associated with the maximum application rate (8 acid equivalent/acre) of triclopyr BEE (hazard quotient of 1.9).

Table 5.10-1. Summary of Hazard Quotients for Workers

Herbicide		Triclopyr BEE								Triclopyr TEA				Imazapyr		Glyphosate			
Application Rate (lb/acre)		3		8		3		8		1		1		0.1		1		8	
Application Volume (gal/acre)		25		25		200		200		25		200		20		10		10	
Scenario : Backpack Applications	Receptor	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation
Accidental/Incidental Exposures [1]										**Hazard Quotient (HQ)**									
Contaminated Gloves, 1 minute	Adult Worker	0.04	0	0.10	0	0.005	0	0.01	0	0.00002	0	0.000003	0	0.000003	0	0.000002	0	0.00001	0
Contaminated Gloves, 1 hour	Adult Worker	**2**	0	**6**	0	0.3	0	0.7	0	0.001	0	0.0002	0	0.0002	0	0.0001	0	0.0009	0
Spill on Hands, 1 hour	Adult Worker	0.004	0	0.01	0	0.0005	0	0.001	0	0.0004	0	0.00005	0	0.00003	0	0.0002	0	0.002	0
Spill on Legs, 1 hour	Adult Worker	0.01	0	0.03	0	0.001	0	0.004	0	0.001	0	0.0001	0	0.00006	0	0.0006	0	0.005	0
General Exposures [2]										**Hazard Quotient (HQ)**									
Chronic	Adult Worker	0.7	0.3	**1.9**	0.9	0.7	0.3	**1.9**	0.9	0.1	0.06	0.1	0.06	0.0002	0.0001	0.003	0.002	0.02	0.01
Acute	Adult Worker	0.03	0.02	0.09	0.05	0.03	0.02	0.09	0.05	0.006	0.003	0.006	0.003	NC	NC	NC	NC	NC	NC

NC = Not calculated, no acute toxicity

[1] Under post mitigation, accidental/incidental exposures would be reduced by following best management practices.

[2] Under post mitigation, general exposures would be reduced by best management practices; the hazards presented consider a protection factor of 50% for the use of personal protective equipment.

Table 5.10-2. Summary of Hazard Quotients for the General Public

Herbicide		**Triclopyr BEE**								**Triclopyr TEA**				**Imazapyr**		**Glyphosate**			
Application Rate (lb/acre)		3		8		3		8		1		1		0.1		1		8	
Application Volume (gal/acre)		25		25		200		200		25		200		20		10		10	
Scenario	**Receptor**	**Pre-Mitigation**	**Post-Mitigation**	**Pre-Mitigation**	**Post-Mitigation**	**Pre-Mitigation**	**Post-Mitigation**	**Pre-Mitigation**	**Post-Mitigation**	**Pre-Mitigation**	**Post-Mitigation**	**Pre-Mitigation**	**Post-Mitigation**	**Pre-Mitigation**	**Post-Mitigation**	**Pre-Mitigation**	**Post-Mitigation**	**Pre-Mitigation**	**Post-Mitigation**
Accidental Acute Exposures										**Hazard Quotient (HQ)**									
Direct Spray of Child Whole Body	Child	0.2	0	0.4	0	0.02	0	0.05	0	0.02	0	0.002	0	0.001	0	0.009	0	0.07	0
Direct Spray Feet and Legs	Adult Female	0.3	0	0.9	0	0.04	0	0.1	0	0.03	0	0.004	0	0.0001	0	0.0009	0	0.007	0
Water Consumption (Spill)	Child	0.4	0	**1.1**	0	0.05	0	0.1	0	0.10	0	0.02	0	0.007	0	0.2	0	**1.4**	0
Fish Consumption (Spill)	Adult Male	0.0007	0	0.002	0	0.00009	0	0.0002	0	0.0002	0	0.00003	0	0.0001	0	0.002	0	0.02	0
Non-Accidental Acute Exposures										**Hazard Quotient (HQ)**									
Vegetation Contact, Shorts and T-shirt	Adult Female	0.5	0	1.5	0	0.5	0	1.5	0	0.04	0	0.04	0	0.00009	0	0.0005	0	0.005	0
Contaminated Fruit	Adult Female	0.7	0	**2**	0	0.7	0	**2**	0	0.2	0	0.2	0	0.0005	0	0.006	0	0.05	0
Contaminated Vegetation	Adult Female	**10**	0	**26**	0	**10**	0	**26**	0	**3**	0	**3**	0	0.007	0	0.08	0	0.6	0
Swimming, 1 hour	Adult Female	0.00008	0	0.0002	0	0.00008	0	0.0002	0	4.E-07	0	4.E-07	0	1.E-08	0	2.E-09	0	2.E-08	0
Water Consumption	Child	0.00009	0	0.0002	0	0.00009	0	0.0002	0	0.0002	0	0.0002	0	0.00006	0	0.0004	0	0.003	0
Fish Consumption	Adult Male	2.E-07	0	4.E-07	0	2.E-07	0	4.E-07	0	4.E-07	0	4.E-07	0	9.E-07	0	5.E-06	0	0.00004	0
Chronic/Longer Term Exposures										**Hazard Quotient (HQ)**									
Contaminated Fruit	Adult Female	0.3	0	0.8	0	0.3	0	0.8	0	0.1	0	0.1	0	0.0002	0	0.0009	0	0.008	0
Contaminated Vegetation	Adult Female	0.6	0	**1.7**	0	0.6	0	**1.7**	0	0.3	0	0.3	0	0.003	0	0.01	0	0.1	0
Water Consumption	Adult Male	9.E-06	0	0.00002	0	0.000009	0	0.00002	0	0.003	0	0.003	0	0.000008	0	0.000003	0	0.00002	0
Fish Consumption	Adult Male	1.E-09	0	3.E-09	0	1.E-09	0	3.E-09	0	2.E-07	0	2.E-07	0	2.E-08	0	5.E-09	0	4.E-08	0

After implementation of best management practices, the accidental acute worker exposure pathway is mitigated. This scenario's key assumption is that wearing gloves grossly contaminated with a chemical solution is equivalent to a worker immersing his hands in the herbicide solution for 1 hour. Such exposure would not occur for workers who comply with the herbicide manufacturer's directions and with standard industrial hygiene practices.

As shown in Table 5.10-1, after mitigation, the chronic general exposure hazard is mitigated. The modeled high application rate is equivalent to the maximum application rate listed on the product label and is EPA-approved for this product. The unmitigated calculations do not account for personal protective equipment (PPE) (e.g., chemical resistant gloves, long-sleeved shirt and long pants, shoes and socks) as recommended by the product label. Several studies have shown that PPE reduces exposure to pesticides for workers. Dermal exposure contributes most of the risk for workers handling herbicides under the proposed use. It is assumed that using PPE, including wearing chemical resistant gloves rated as high on the EPA Chemical Resistant Category Selection Chart, would eliminate most of the dermal exposure for workers. A reduction factor of 50% was selected as a conservative estimate of the potential risk reduction for workers wearing appropriate PPE; actual risk reduction would be higher for workers following label instructions. When a protection factor of 50% is assumed in the model for the use of personal protective equipment, the hazard quotient is reduced to 0.9, which is less than the hazard quotients level of concern of 1 (details in Section 6 of Appendix F). In a study by Middendorf (1992), the wearing of gloves during the backpack application of triclopyr was shown to reduce worker exposure by a factor of 4.4. Based on this study and the fact that the application rate modeled likely overestimates actual application, it is likely that the modeled exposure scenario that results in hazard quotients at or above the level of concern would not occur for workers who comply with the herbicide manufacturer's directions and with standard industrial hygiene practices.

General Public

As shown in Table 5.10-2, before mitigation, the general public exposure pathways that result in hazard quotients at or above the level of concern are the accidental acute exposure through ingestion of water that has been contaminated by a spill (triclopyr BEE [hazard quotient of 1.1] and glyphosate [hazard quotient of 1.4]) in least dilute formulation by a child; non-accidental acute exposure through consumption of recently sprayed fruit or vegetation with consequent exposures to triclopyr and 3,5,6-trichloro-2-pyridinol (TCP), the primary metabolite of triclopyr (hazard quotients range from 3 to 26) by a young woman; and chronic exposure through consumption of contaminated fruit or vegetation in areas treated with triclopyr BEE (hazard quotient of 1.7) by a young woman.

After implementation of best management practices, all general public exposure pathways (accidental acute, non-accidental acute, and chronic exposures) are mitigated. Most of the exposure pathways for the general public would be eliminated when mitigation measures are considered. Proper application and consideration of safety measures by herbicide applicators would prevent contamination of media that the general public could contact. Restricting access to treated areas would eliminate exposure to contaminated vegetation and reduce the possibility that people would consume contaminated fruits or other vegetation. Buffers restricting treatment near surface water bodies would eliminate contamination of surface water thereby eliminating

exposure pathways associated with contaminated surface water, such as ingestion of water contaminated by a spill or swimming in water contaminated by a spill or drift.

The health risk assessment indicated that the proposed use of herbicides would not create a health risk that would disproportionately affect children. Therefore, the proposed herbicide use would comply with Executive Order 13045, Protection of Children From Environmental Health Risks and Safety Risks.

5.10.2.3.5 Uncertainties

As discussed throughout this risk assessment, summary exposure assumptions used to evaluate exposure to receptors of concern are very conservative, in other words, the hazards presented are likely greatly overestimated. Thus, the risk assessment should not be construed as presenting absolute hazards; instead, it is intended to indicate the potential for adverse impacts to occur based on maximum exposed receptor scenarios. In addition, several exposure scenarios evaluated consider extreme accidental exposure. As part of the interpretation of the hazards presented in this summary, it is important to consider that best management practices are expected to eliminate or reduce exposure for many of the exposures pathways evaluated in this risk assessment. This and other uncertainties associated with the risk assessment are discussed in detail in Section 6 of Appendix F.

5.10.2.3.6 Other Measures That Would Reduce Exposure

To reduce worker exposure to herbicides, the subapplicants would comply with state and federal OSHA standards for exposure to hazardous materials in the workplace. To minimize potential exposure of workers and the public, the amount of herbicide used would be the minimum amount required to achieve the needed results. Only licensed or certified pest control operators registered to apply the herbicides would be allowed to conduct the chemical applications and only under a prescription prepared by a licensed pesticide advisor (for EBRPD projects, the dedicated advisors are Integrated Pest Management specialists). The operators would also be required to maintain accurate and calibrated application equipment to ensure that the amounts of herbicides applied are as proposed.

To reduce public exposure to herbicides, the subapplicants would follow procedures for public notification and education, including posting the timing, location, and approximate amounts and types of pesticides or other chemicals to be applied at least 24 hours in advance. Herbicides would be applied using hand-held equipment. No spraying of foliage would occur within 60 feet of standing or flowing water. Within this 60-foot buffer, herbicides would only be applied directly to stumps, and use of herbicides would be restricted to Garlon 3A or other herbicides approved for use near water. Herbicides would not be used in the 60-foot buffer within 24 hours after rain or when the chance of rain within 24 hours is greater than 40%. To prevent airborne drift of herbicide mist into the 60-foot buffer, herbicides would not be applied to foliage outside the buffer when wind speed is greater than 10 miles per hour (mph) or less than 2 mph. Very low wind speeds are conducive to drift because very light winds are highly variable and are associated with inversion conditions in which mists and vapors tend to stay near the ground rather than dispersing upward.

Implementing the proposed and connected actions would reduce the amount of fuels in high hazard areas thereby reducing the threat of wildfires. This would have a significant beneficial effect on public health and safety.

Based on the above analysis, implementation of the proposed and connected actions would comply with applicable federal, state, and local statutes and regulations (described in Section 4.11.1).

5.10.3 Avoidance and Mitigation Measures

No additional mitigation measures other than those identified under Section 5.4, Water Resources, are required for impacts to human health and safety.

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5.11 Public Services, Infrastructure, and Recreation

This section analyzes the potential effects on public services, infrastructure, and recreation from implementation of the proposed and connected action and the no action alternative.

Potential effects to transportation infrastructure are discussed in Section 5.13. Effects on aesthetics and visual quality are discussed in Sections 5.8 and 6.6.

5.11.1 Public Services and Infrastructure

This section describes the methodology for assessing potential effects on public services and infrastructure and describes those effects.

5.11.1.1 Methodology

To determine impacts on public services and infrastructure, utilities and service systems in the project area were identified, as described in Section 4.12, and potential impacts on those systems were assessed. The discussion of public services includes demands for energy resources generated by the proposed and connected actions.

5.11.1.1.1 Determination of Significance of Effects

Based on the requirements of NEPA, impacts to public services and utilities would be significant if they would do any of the following:

- Result in increased demand for utilities that could exceed the capacity and outputs of existing facilities or infrastructure and require new or expanded facilities or infrastructure that could result in significant environmental impacts
- Result in significant adverse impacts associated with the provision of new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives, the construction or alteration of which could cause significant environmental impacts
- Result in failure to comply with applicable federal, state, and local statutes and regulations

5.11.1.2 Effects Analysis

5.11.1.2.1 No Action Alternative

Under the no action alternative, the proposed and connected actions would not be implemented. As described in Section 3.4.1, each applicant would continue certain basic vegetation management activities to attempt to control fire risk in high hazard areas.

The no action alternative would not increase demand for existing energy resources, other utilities, hospitals, fire-fighting resources, or police protection resources. The no action alternative would not result in changes to existing service ratios, response times, or other performance objectives of public services. The no action alternative would comply with

applicable state and local laws and regulations (described in Section 4.12.1.1). There would be no adverse effect.

The absence of substantial vegetative fuel reduction under the no action alternative would make a major wildfire more likely. In the case of a future high severity wildfire, there would likely be significant adverse effects to public services, such as police and fire resources.

5.11.1.2.2 Proposed and Connected Actions

Implementation of the proposed and connected actions would not increase water use or wastewater production. Energy use would increase temporarily, but the overall effect would not be significant. Section 5.5, Air Quality, discusses impacts from vehicle fuel combustion during implementation and maintenance of the proposed and connected actions.

Tree removal and use of herbicides could cause short-term health and safety impacts that could increase the demand for emergency and health care services, but the effect would not be significant. Human health and safety effects are analyzed in Section 5.10.

Implementation of the proposed and connected actions would not affect the provision of other public services in the vicinity including the public schools described in Section 4.12.

Maintenance and long-term monitoring would take place for up to 10 years following implementation. During maintenance, workers would apply herbicides and remove sprouts and seedlings, but no trees would be removed. Health and safety risks related to long-term maintenance are discussed in detail in Section 5.10, Human Health and Safety. Long-term maintenance of the proposed and connected project areas would not result in significant adverse effects to public services and infrastructure, including public schools. Effects on public services and infrastructure would not be adverse and significant.

Section 5.13, Transportation, discusses potential effects related to increased traffic during project implementation and effects to traffic.

Implementation of the proposed and connected actions would comply with applicable state and local laws and regulations (described in Section 4.12.1.1). There would be no significant adverse effect.

5.11.1.3 Avoidance and Mitigation Measures

No avoidance or mitigation measures are specified for effects to public services and infrastructure.

5.11.2 Recreation

This section analyzes the effects to recreation that could result from implementation of the proposed and connected actions and the no action alternative.

5.11.2.1 Methodology

Regional and local parks, open space, trails, and other recreation resources in the project area were identified, as described in Section 4.12. This section assesses how they would be affected by the proposed and connected actions. An effect on recreation would be significant if it would significantly reduce access to recreation resources or result in changes to the recreational setting or facilities. Reduced access and changes to recreational setting and facilities were assessed qualitatively; changes in user views and potential significant adverse effects are analyzed in Section 5.8. The short-term effects analysis includes a discussion of potential areas where recreational access would be restricted during project implementation. The assessment of long-term effects discusses potential changes in the recreational setting and experience. Section 5.8 Aesthetics and Visual Quality, presents a detailed analysis of effects on visual quality.

5.11.2.2 Effects Analysis

5.11.2.2.1 No Action Alternative

Vegetation management activities under the no action alternative would not differ significantly from current vegetation management activities. Current activities do not significantly affect recreation. Therefore, the no action alternative would have no significant effect on recreation.

The absence of substantial vegetative fuel reduction under the no action alternative would make a major wildfire more likely. The occurrence of wildfires could adversely impact aesthetics, wildlife habitat, and shade along trails and roads in the project areas. These impacts would adversely affect recreational amenities, including the highly valuable EBRPD resources listed in Table 4.12-4. Impacts from a high severity wildfire would likely be significant and adverse.

5.11.2.2.2 Proposed and Connected Actions

As described in Section 4.12, portions of the proposed and connected project areas are close to or intersect with trails, park access points, picnic areas, parking areas, swimming and water sport access areas, and other recreational facilities.

Implementation of the proposed and connected actions would require temporary restrictions on access to portions of the parks and other open space areas in which the proposed and connected actions would occur. The City of Oakland may temporarily close the major trail connecting the Caldecott Ballfields in the proposed Caldecott Tunnel-PDM project area with the water tank at the edge of the residential area to the southeast. UCB expects that most trails or roads adjacent to or near its proposed project areas would not be closed, with the exception of the Upper Jordan Fire Trail in Frowning Ridge-PDM, which is proposed to be closed to the general public during implementation. EBRPD does not expect any recreational trails adjacent to or near the proposed and connected project areas to be closed. Staging and landings for equipment at each park and preserve would occur along roads or other locations off of existing park and fire trails.

As discussed in Section 5.13, bicycle and pedestrian use of trails and public roads in and adjacent to the proposed and connected project areas during expected working hours is minimal. Thus, adverse effects on recreational use of public roads would not be significant. Additionally, during implementation of the proposed and connected actions, visitors could continue to use areas of the

parks that are outside the proposed and connected project areas; therefore, there would be no significant adverse effects to recreation access or to the quality of recreational experiences.

Short- and long-term changes to the visual experience at regional and local parks would occur from implementation of the proposed and connected actions. Although these changes could reduce the quality of the recreational experience in the short term, these changes would not result in long-term effects after regrowth of native species. Even in the short term, the recreational experience would not be significantly reduced or eliminated. Section 5.8, Aesthetics and Visual Quality, analyzes effects to visual resources in detail.

Ongoing maintenance would take place in the same locations as initial implementation of the proposed and connected actions. Maintenance would not significantly restrict access to the parks and open space areas or to trails. Maintenance activities would not significantly affect the overall quality or availability of recreational opportunities. Therefore, maintenance of the proposed and connected actions would not have a significant impact on recreation.

Implementation of the proposed and connected actions is proposed to reduce the severity of potential future wildfires in the project areas. Reduction in the occurrence and/or severity of wildfires would have beneficial impacts on recreational resources, including the highly valuable resources listed in Table 4.12-4.

5.11.2.3 Avoidance and Mitigation Measures

No mitigation measures are specified for effects to recreation.

5.12 Land Use and Planning

This analysis of land use and planning impacts evaluates the potential for the proposed and connected actions and the no action alternative to affect land use in a way that results in inconsistencies with applicable plans and zoning. The following sections summarize the potential land use impacts and land use benefits associated with the proposed and connected actions and the no action alternative.

The proposed and connected project area for this land use impact assessment includes portions of the jurisdictions where the proposed and connected actions would occur: the cities of Richmond, El Cerrito, Berkeley, and Oakland; unincorporated communities in Alameda and Contra Costa counties; and lands managed by UCB and EBRPD.

The key issues examined are:

- Whether the proposed and connected actions and the no action alternative would be compatible with existing land use in and adjacent to the project areas
- Whether the proposed and connected actions and the no action alternative are consistent with planned future land uses, as defined in city and county general plans, the EBRPD Master Plan, and the UCB 2020 Long Range Development Plan
- How well the proposed and connected actions and the no action alternative support land use goals and comply with land use policies

Housing impacts and induced growth are addressed in Sections 4.10 and 5.9 of this EIS.

5.12.1 No Action Alternative

Under the no action alternative, current land use would not change. Therefore, the no action alternative would be compatible with existing land use. The no action alternative would not interfere with planned future land uses and would therefore be consistent with planned future land uses. Under the no action alternative, compliance with land use policies would not change. The no action alternative would support land use goals to the same extent to which they are currently supported. The no action alternative would not provide additional support to land use policies designed to promote hazardous fire risk reduction.

5.12.2 Proposed and Connected Actions

5.12.2.1 Castro Valley General Plan

Portions of the proposed and connected actions are adjacent to and north of Castro Valley. The Castro Valley General Plan Land Use and Development Element’s main goal is to allow infill housing and add new retail, restaurants, services, and employment while preserving the small town character of the area (County of Alameda 2010a). The proposed and connected actions would maintain all open space and recreation uses; therefore, no change to land use would result within Castro Valley. In addition, the proposed and connected actions would be consistent with the general plan’s land use and development policies. Therefore, the proposed and connected actions would have no land use effects in Castro Valley.

5.12.2.2 Contra Costa County General Plan

A portion of the proposed and connected actions would occur in Contra Costa County. The general plan's Land Use Element aims to ensure preservation of non-urban agricultural areas and open space by establishment of an urban limit line (County of Contra Costa 2005b).The proposed and connected actions would maintain all open space and recreation uses; therefore, no change to land use would result in Contra Costa County. In addition, the proposed and connected actions would be consistent with the general plan's land use and development policies. Therefore, the proposed and connected actions would be consistent with the Contra Costa County General Plan and would have no effect on land use.

5.12.2.3 City of Oakland General Plan

A portion of the proposed and connected actions would occur in the City of Oakland (Oakland) and in parks and preserves adjacent to Oakland. The proposed and connected actions would maintain all open space and recreation uses; therefore, no change to land use would result in or adjacent to Oakland. In addition, the proposed and connected actions would be consistent with the land use and development policies in the City of Oakland General Plan. Therefore, the proposed and connected actions would have no land use effects in or adjacent to Oakland.

5.12.2.4 UCB 2020 Long Range Development Plan

Three proposed and connected project areas totaling 284 acres are in UCB's Hill Campus. The UCB 2020 Long Range Development Plan includes an objective to "maintain the Hill Campus as natural resources for research, education, and recreation, with focused development of suitable sites" (UCB 2005). The proposed and connected actions would be consistent with this objective because they would not change land use on the Hill Campus.

The 2020 Long Range Development Plan identifies the Claremont Canyon Regional Preserve project area, which includes the Claremont-PDM proposed project area, as a possible site for faculty housing and a campus retreat center. However, the plan states that more promising near-term options exist for both faculty housing and conference facilities and that these options must be fully explored before development of the Claremont Canyon Regional Preserve project area is given serious consideration (UCB 2005). The proposed removal of all eucalyptus trees from the Claremont-PDM site would be consistent with this plan.

The plan includes specific policies to manage fire risk in the Hill Campus, including vegetation management to reduce fuel loads, favoring species with lower fuel content, and separating vegetation clusters as well as understory and crown fuels. The plan favors ultimate eradication of invasive non-native species and restoration of native grassland and oak woodland but states that this must be done with consideration of impacts to wildlife habitat. The proposed and connected actions would support these policies.

The proposed and connected actions would support or be consistent with the applicable land use policies in UCB's 2020 Long Range Development Plan.

5.12.2.5 City of Richmond General Plan

A portion of the proposed and connected actions would occur in Richmond, which includes part of Wildcat Canyon Regional Park, part of the Hasford Heights community, Sobrante Ridge Regional Preserve and adjacent neighborhoods, and Miller/Knox Regional Shoreline. The proposed and connected actions would maintain all open space and recreation uses; therefore, no change to land use would result in any of these areas. The goals in the Richmond General Plan's Land Use and Urban Design Element focus on creating vibrant corridors, active open spaces, compact development, and enhanced neighborhood character (City of Richmond 2011a). The proposed and connected actions would be consistent with these goals. Therefore, the proposed and connected actions would have no land use effects in the City of Richmond.

5.12.2.6 City of Berkeley General Plan

None of the proposed and connected actions would occur in the City of Berkeley or affect land use in Berkeley. The goals in the City of Berkeley General Plan's Land Use Element include reducing hazardous fire risk, and the proposed and connected actions would support this goal (City of Berkeley 2001a). Therefore, the proposed and connected actions would not change land use in Berkeley but would support the goals of the City of Berkeley's General Plan.

5.12.2.7 City of El Cerrito General Plan

Several proposed project areas are adjacent to El Cerrito in Wildcat Canyon Regional Park, but the proposed and connected actions would have no effect on land use in El Cerrito. The proposed and connected actions would be consistent with policy CD 1.8 of the Community Development and Design Chapter of the City of El Cerrito General Plan, which calls for preservation and enhancement of the city's hillside open spaces adjacent to Wildcat Canyon Regional Park (City of El Cerrito 1999). Therefore, the proposed and connected actions would be consistent with the City of El Cerrito General Plan and would have no land use effects.

5.12.2.8 EBRPD Master Plan

The only EBRPD plans effective within the proposed and connected project areas are the 2012 Draft Master Plan and Wildfire Hazard Reduction and Resource Management Plan (EBRPD 2012d , EBRPD 2009b). EBRPD's proposed and connected actions are designed to support this plan by reducing hazardous fire risk on EBRPD land and at EBRPD facilities. The hazardous fire risk reduction projects proposed in the applications submitted by UCB and Oakland would also support the goals of the EBRPD plan. The proposed and connected actions would maintain all open space and recreation uses; therefore, no change to land use would result in EBRPD property. The proposed and connected actions would support the EBRPD Master Plan and would have positive land use effects.

5.12.3 Avoidance and Mitigation Measures

No avoidance or mitigation measures are specified for land use and planning.

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5.13 Transportation

This section assesses the effects the proposed and connected actions and the no action alternative would have on nearby transportation-related facilities and within the project areas. These include effects on traffic flow, traffic safety, transit operations, and circulation and operations of nonmotorized modes of travel. Initial implementation of the proposed and connected actions or the no action alternative is most likely to occur between 2013 and 2016, particularly during the dry season. An extended maintenance period would follow initial implementation.

5.13.1 Proposed and Connected Actions

5.13.1.1 Methodology

The following subsections describe methods used to analyze the effects of the proposed and connected actions on transportation.

5.13.1.1.1 Effects on Traffic Flow

Each subapplicant submitted information regarding implementation and maintenance of the proposed and connected actions, particularly the number of worker vehicles and pieces of large equipment, anticipated road closure durations, worker travel routes and timing, total number of workers, and worker traffic routes and timing. If applicable, information regarding staging areas for workers and methods of site access was also submitted.

While the proposed and connected project areas are in the San Francisco Bay metropolitan area, they are mainly within the East Bay Hills, which have primarily residential and hilltop roads. These roads generally do not experience commuting traffic unrelated to nearby homes. Therefore, it was assumed that existing traffic would be fairly uniform throughout the day.

5.13.1.1.2 Effects on Traffic Safety

As part of the proposed and connected actions, new skid trails and temporary roads would be created to provide access to portions of some project areas. These trails and roads would be evaluated for potential safety hazards, including blind corners and turnouts, poor sight distance, and sharp turns or other areas where worker traffic or equipment might conflict with high speed limits.

5.13.1.1.3 Effects on Public Transit

Existing local and regional transit service routes were evaluated to determine potential conflicts with implementation and maintenance of the proposed and connected actions. In particular, the effects of worker volumes and the potential for traffic delays due to mechanical or equipment placement were evaluated. The analysis relates anticipated worker volumes to ridership and road closures to potential disruptions in transit service.

5.13.1.1.4 Effects on Nonmotorized Transportation

Existing bicycle routes and trails within the area of analysis were identified and were categorized by class. These routes were then compared to anticipated equipment and fire trail routes in order

to determine potential effects on the mobility and safety of cyclists. Available local or county planning documents addressing bicycle planning in the area were also previously reviewed to evaluate potential effects on planned bicycle paths and routes. In addition, the analysis addressed potential areas of conflict between implementation actions and pedestrians as well.

5.13.2 No Action Alternative

Under this alternative, the proposed and connected actions would not be implemented. No implementation or maintenance-related construction trips or other transportation-related effects would occur under this alternative.

5.13.2.1 Effects on Traffic Flow

Because the no action alternative would add no implementation or maintenance trips, no roads would experience additional traffic flow. In addition, road closures would not occur. Traffic volumes along project area roads would remain similar to existing conditions. Therefore, no traffic flow effects would occur under the no action alternative.

5.13.2.2 Effects on Traffic Safety

As stated in the traffic flow summary above, the no action alternative would not add implementation or maintenance trips. Therefore, no traffic safety effects are expected to occur under the no action alternative.

5.13.2.3 Effects on Public Transit

The no action alternative would have no effect on public transit.

5.13.2.4 Effects on Nonmotorized Transportation

Under the no action alternative, bicycle and pedestrian access to trails, sidewalks, and roads would remain the same as under existing conditions. Therefore, nonmotorized transportation is not expected to be affected by the no action alternative.

5.13.3 Proposed and Connected Actions

The proposed and connected actions would include two phases: implementation and maintenance. Both phases would occur in all project areas. The implementation phase would create most of the transportation-related effects, due to the mechanized equipment anticipated to be used and the intensity of the actions to take place. Table 5.13-1 lists the project areas where mechanized equipment, such as mowers, chippers, or fellerbunchers, would be used in order to determine the sites most likely to experience some transportation-related effects.

5.13.3.1 Effects on Traffic Flow

The proposed and connected actions would affect roads within and around the project areas. The primary effects on traffic flow would be caused by increases in traffic volumes due to construction workers and construction-related detours redirecting traffic to other roads. As Table 5.13-1 indicates, equipment staging would occur at most project area sites but would only be

placed on site once a season. Most work would still be conducted by hand, with only small amounts of earth disturbance associated with new temporary access road construction.

Table 5.13-1. Summary of Affected Areas and Mechanized Equipment Usage

Subapplicant and Project Area	Number of Action Sites (Proposed/ Connected)	Proposed Project Areas		Connected Project Areas	
		Would Mechanized Equipment be Used?	Number of Sites Affected	Would Mechanized Equipment be Used?	Number of Sites Affected
EBRPD – Sobrante Ridge Regional Preserve	1/0	No	0	N/A	-
EBRPD – Wildcat Canyon Regional Park	5/3	Yes	4	Yes	3
EBRPD – Miller/Knox Regional Shoreline	5/0	Yes	3	N/A	-
EBRPD – Tilden Regional Park	4/13	Yes	3	Yes	8
EBRPD – Claremont Canyon Regional Preserve	8/9	Yes	7	Yes	7
EBRPD – Sibley Volcanic Regional Preserve	4/6	Yes	2	Yes	4
EBRPD – Huckleberry Botanic Regional Preserve	4/1	Yes	1	No	0
EBRPD – Redwood Regional Park	8/5	Yes	7	Yes	3
EBRPD – Anthony Chabot Regional Park	9/8	Yes	6	Yes	7
EBRPD – Leona Canyon Regional Open Space Preserve	1/0	No	0	N/A	-
EBRPD – Lake Chabot Regional Park	1/0	Yes	1	N/A	-
UCB – Strawberry Canyon-PDM	1/0	Yes	1	N/A	-
UCB – Claremont-PDM	1/0	Yes	1	N/A	-
Oakland – Frowning Ridge-PDM[(1)]	1/0	Yes	1	N/A	-
Oakland – North Hills-Skyline-PDM	1/0	Yes	1	N/A	-
Oakland – Caldecott Tunnel-PDM	1/0	Yes	1	N/A	-
Oakland – Tilden Regional Park	5/0	Yes	5	N/A	-

[(1)]Frowning Ridge-PDM is a project area located in the City of Oakland but would be implemented and maintained by UCB.

"N/A" indicates that no connected project area is associated with the proposed project area.

5.13.3.1.1 EBRPD

EBRPD estimates approximately 10 workers from various locations to work on the proposed and connected project areas for a duration of 280 working days. Workers were assumed to arrive from locations between the cities of Hayward and Vallejo. Assuming that all 10 workers arrived daily in separate private vehicles, none of the roads near or within the proposed and connected project areas would be significantly impacted.

The California Department of Transportation (Caltrans) *Guide for the Preparation of Traffic Impact Studies* (2002) states that typically the generation of 10 peak hour travel trips by a

proposed action would only trigger further analysis under atypical circumstances, such as addition of vehicles on severely congested roads; increasing the risk for traffic incidents as a result of congestion, conflict points, or sight distance considerations; or changes in the nearby circulation network as a result of the project. The addition of 10 vehicle trips would not warrant further analysis by the Caltrans criteria due to the low traffic volumes on the affected roads. In addition, roadways within regional parks and preserves would see more traffic on weekends when more people have time for recreation. Implementation of the proposed and connected actions would occur primarily on weekdays. Nearby highways, such as Interstate (I) 80 and I-580 would potentially receive an additional few vehicles during commuting periods, but given the low number of potential worker vehicle trips, this addition of vehicle trips would not be significant.

For the Sibley Volcanic Regional Preserve, EBRPD estimates that eight workers would work on implementation of the proposed and connected actions. As with other affected EBRPD areas, nearby roads would be residential in nature or have low traffic volumes. Therefore, the addition of eight vehicle trips would not be a significant impact on local or regional roads.

EBRPD reported that only Skyline Boulevard would need to be closed temporarily during implementation. The affected section of Skyline Boulevard is near Grizzly Peak Boulevard at the Sibley Triangle (connected project areas SR002a and SR002b). The closures would be no longer than 30 minutes. Skyline Boulevard in the Sibley Triangle area is a two-lane road with a narrow right-of-way. Given its location and distance from major attractions, traffic volumes in this area would be low, and closure of Skyline Boulevard for 30 minutes would affect traffic minimally and would not be a significant impact. Closures would be recommended to take place during non-commuting hours or identified time periods where traffic is lower than normal. However, should road closures delay traffic by 30 minutes, this limited amount of traffic stopped may consider finding alternative routes to detour around the closure.

Given that low numbers of workers would access the proposed and connected project areas and the limited number of road closures, traffic flow in EBRPD areas would not be significantly impacted by the proposed and connected actions.

5.13.3.1.2 UCB

Claremont-PDM would have some acreage used for equipment while Strawberry Canyon-PDM and Frowning Ridge-PDM would have sufficient existing access roads and locations for equipment. It is expected that any waste resulting from implementation, such as tree chips and logs, would remain in the project areas, resulting in no truck or transport trips.

Table 5.13-2 exhibits UCB estimates for numbers of persons anticipated to work at each project area and the anticipated maximum number of vehicle-trips based on this number of workers. The Frowning Ridge-PDM worker information is exhibited here as it is located on UCB property within the City of Oakland (Oakland). It is expected to be implemented and maintained by UCB under a contract between Oakland and UCB.

Table 5.13-2. Summary of UCB Proposed Action Anticipated Workers and Vehicle-Trips

Affected Jurisdiction and Area	Number of Workers	Estimated Maximum Vehicle-Trips
UCB – Strawberry Canyon-PDM	12-16	6
UCB – Frowning Ridge-PDM[1]	16-20	12
UCB – Claremont-PDM	10-14	5

[1] Frowning Ridge-PDM is located on UCB property but would be implemented and maintained by Oakland.

A maximum of 16 workers at the Strawberry Canyon-PDM action site project area, 20 workers at the Frowning Ridge-PDM site, and 14 workers at the Claremont-PDM site would work at the proposed project areas owned by UCB during 12 weeks a year for 2 years in each area. Workers were assumed to arrive from various locations around the East Bay. Other vehicle operations, such as equipment placement and removal, would occur only twice a year.

Due to the low numbers of people anticipated to work at each project area site, it is expected that none of the roads near or within the proposed project areas associated with UCB would be significantly impacted by worker vehicles. This is due to the low-volume nature of many of the nearby roads bordering and accessing the proposed project areas. Additionally, roads identified as potentially affected by the proposed and connected actions are generally local roads bordering regional parks; as such, these roads experience low traffic volumes and carry no through traffic. In addition, roads within regional parks and preserves would see more traffic on weekends when more people have time for recreation. Implementation of the proposed actions would occur primarily on weekdays. Nearby freeways and major arterials, such as I-80 and I-580, would potentially receive an additional few vehicles during commuting periods, but given the very low number of maximum potential worker vehicle-trips, this addition of vehicle-trips would be insignificant. The number of trips generated by workers for these three project areas would be much less than the minimum trip generation that triggers further analysis under the Caltrans *Guide for the Preparation of Traffic Impact Studies* (2002).

UCB identified roads that would be affected by temporary closures during implementation of the proposed action. For Strawberry Canyon-PDM, Centennial Drive between Grizzly Peak Boulevard and the Lawrence Hall of Science would be closed to traffic for periods up to 5 minutes using flag controls during non-commuting periods (defined by UCB as between 9:00 a.m. and 2:30 p.m.) to clear felled debris and other materials from roadways, for a maximum of 3 days. Similarly, for Claremont-PDM, Claremont Avenue between Grizzly Peak Boulevard and Alvarado Road would be closed for periods up to 5 minutes during non-commuting hours to accommodate removal of felled debris and other materials for a maximum of 5 days. For Frowning Ridge-PDM, portions of Grizzly Peak Boulevard between Centennial Drive and South Park Drive near Tilden Regional Park could be closed for periods up to 5 minutes during non-commuting hours to accommodate removal of felled tree debris and other materials for a maximum of 3 days.

Closure of roads for up to 5 minutes at a time would not significantly affect traffic along these roads and would not be a significant impact. Roadway closures would only be expected when debris resulting from tree felling would accumulate on project area roadways. It is expected that

UCB would design felling operations to avoid trees from falling along public roadways. In addition, these road closures would occur during off-peak travel hours in undeveloped or sparsely developed areas with low traffic volumes. Therefore, the road closures identified by UCB would not impede travel along affected roads since traffic volumes would be low and delays would be short. Given that low numbers of workers would access the proposed project areas and road closures would be minimal, traffic flow in UCB areas would not be significantly impacted by the proposed and connected actions.

In addition, UCB's 2020 Long Range Development Plan (LRDP) expects that minimal construction-related traffic and temporary constraints on emergency access would occur as part of small amounts of development in the Hill Campus near the Lawrence Berkeley Laboratory area. UCB developed mitigation measures to reduce the impacts identified in the 2020 LRDP. These include developing detour routes, ensuring at least one lane remains open on any affected road, and meeting with the construction contractor to ensure that impacts on parking and circulation near construction sites would be minimized. This is consistent with the expected types of impacts from proposed and connected action implementation (UCB 2003).

5.13.3.1.3 Oakland

Oakland has three sites involved with the proposed and connected actions. The Frowning Ridge-PDM site is located within Oakland property but would be implemented by UCB under grant contract to Oakland.

The city indicated that up to 16 workers and 14 workers would be on site at Caldecott Tunnel-PDM and North Hills-Skyline-PDM sites, respectively. Oakland anticipates that workers would commute to proposed project area sites via carpool and company vehicles, reducing expected numbers of vehicle-trips. Workers were assumed to arrive from various locations around the East Bay. Other vehicle operations, such as equipment placement and removal, would occur only twice a year. No information was provided regarding maximum expected numbers of workers at the Tilden Regional Park project area. However, since the size and scale of this project area is similar to EBRPD, Oakland, and UCB sites, it was assumed that a similar number of workers would access the site for a similar time period during the annual dry season.

Due to the low numbers of people anticipated to work at each project area site, it is expected that none of the roads near or within the proposed project areas associated with Oakland would be significantly impacted by worker vehicles. This is due to the low-volume nature of many of the nearby roads bordering and accessing the proposed project areas. Additionally, roads identified as potentially affected by the proposed and connected actions are generally local roads bordering regional parks and experience low traffic volumes as a result of being located in hilly and low-density areas of Oakland. In addition, roads within regional parks and preserves would see more traffic on weekends, when more people have time for recreation. Implementation of the proposed actions would occur primarily on weekdays. Nearby freeways and major arterials, such as State Route (SR) 24 and I-580 would potentially receive an additional few vehicles during commuting periods, but given the very low number of maximum potential worker vehicle-trips, this addition of vehicle-trips would be insignificant. The number of trips generated by workers for these three project areas would be much less than the minimum trip generation that triggers further analysis under the Caltrans *Guide for the Preparation of Traffic Impact Studies* (2002).

For Caldecott Tunnel-PDM, portions of Broadway at the Caldecott Tunnel SR 24 entrance and between 5852 and 5878 Skyline Boulevard could be closed for 5-minute periods while North Hills-Skyline-PDM could have portions of Grizzly Peak and Skyline Boulevards near the project area closed for up to 5-minute periods. These 5-minute roadway closures would occur during non-commuting hours (defined by the city as between 9:00 a.m. and 2:30 p.m.) using flag control crews and warning signs in order to clear felled debris and other materials from roadways for up to a 3-day period. Oakland did not identify roads that would be affected by temporary closures during implementation of the proposed actions for the Tilden Regional Park site but indicated that 24-hour notice would be given to adjacent jurisdictions, including the City of Berkeley, EBRPD, and the East Bay Municipal Utility District (EBMUD).

Closure of roads for brief periods at a time with advance notice would not significantly affect traffic along these roads and would not be a significant impact. Roadway closures would only be expected when debris resulting from tree felling would accumulate on project area roadways. It is expected that Oakland would design felling operations to avoid trees from falling along public roadways. In addition, these road closures would occur during off-peak travel hours in sparsely developed areas with low traffic volumes. Therefore, the road closures identified by Oakland would not impede travel along affected roads since traffic volumes would be low and delays would be short. Given that low numbers of workers would access the proposed project areas and road closures would be minimal, traffic flow in Oakland areas would not be significantly impacted by the proposed and connected actions.

5.13.3.2 Effects on Traffic Safety

Traffic safety would be an issue for the proposed and connected actions when new or existing access roads connecting to public roads would be used as part of implementation and maintenance. The primary effects on traffic safety would be caused by treatments during implementation that could interrupt or impede passing traffic, such as trees falling into the road and slow-moving trucks and equipment moving from fire roads/landings and onsite trails onto public roadways. These safety issues could decrease safety and increase the risk of vehicular crashes.

5.13.3.2.1 EBRPD

EBRPD anticipates that some of the connected project areas in Anthony Chabot Regional Park would require new fire or skid trails and dirt roads to provide access to trees, brush, and other debris to be cleared. All other proposed and connected project areas are expected to use existing access roads to transport equipment to action sites during implementation and for worker access during implementation and maintenance.

Based on the information received, any new access roads created as part of the proposed and connected actions would connect to low-volume roads with relatively low travel speeds. These roads would not experience high turning volumes; however, because the topography of most of the proposed and connected project areas is hilly, a flag control crew would be available to control traffic while placement of equipment, debris removal, or truck entrances and exits are occurring.

Because EBRPD's proposed and connected project areas would have minimal new openings of fire and access roads and flag crews would control traffic during placement of equipment, no significant impacts would be anticipated on traffic safety on nearby roads.

5.13.3.2.2 UCB

UCB anticipates that previously used fire or skid access trails primarily would be used to reach trees, brush, and other debris to be removed. UCB expects to use access trails that cross or are present on the periphery of the sites to transport necessary equipment while minimizing soil disturbance.

For Strawberry Canyon-PDM, nine landings exist adjacent to fire trails or paved roads in the project area. Equipment would be refueled and staged at these landings. Should new landings or fire trails be needed, they would be placed in areas with relatively low slope and stable soil.

For Claremont-PDM, five landings exist adjacent to fire trails or paved roads. Three temporary access roads are anticipated to be required for the proposed action.

Frowning Ridge-PDM project area has 12 landings adjacent to fire trails or paved roads. The Upper Jordan Fire Trail, an unimproved road on UCB land for pedestrian and emergency vehicle use, would be closed to the public as necessary during implementation. No new fire or skid trails and access roads would be built at the Frowning Ridge-PDM site.

UCB may create additional landings when the distance from a group of targeted trees to an existing landing exceeds 600 feet. A flag control crew would be needed to control traffic during placement of equipment at any new or existing landings to be used for implementation purposes as well as when debris is removed or when trucks re-enter public roadways from off-road fire trails and landings. No significant impact on traffic safety is expected.

5.13.3.2.3 Oakland

Oakland anticipates that no other new fire or skid trails and access roads at any of the project areas would be necessary to provide access to trees, brush, and other debris to be cleared. All proposed project areas are expected to use existing access roads or fire trails to transport equipment and material to and from action sites during implementation and for worker access during implementation and maintenance.

Because the topography of most of the proposed project areas is hilly, a flag control crew at existing skid trails or access roads that would be utilized would be available to control traffic while placement of equipment, debris removal, or truck entrances and exits are occurring.

Because Oakland's proposed project areas would have no new fire trails or access roads and flag crews would control traffic during placement of equipment, no significant impacts would be anticipated on traffic safety on nearby roads.

5.13.3.3 Effects on Public Transit

Public transit would be affected by the proposed and connected actions if additional trips via transit were taken by persons accessing the project areas or if transit would be delayed by implementation or maintenance of the proposed and connected actions.

5.13.3.3.1 EBRPD

Because public transit near EBRPD's proposed and connected project areas is minimal, the proposed and connected actions would have no significant impact on public transit.

5.13.3.3.2 UCB

Because public transit service near the proposed UCB project areas is minimal, no public transit trips are expected to be taken by workers on the proposed action. The only area where public transit would be affected would be Centennial Drive near Strawberry Canyon-PDM where trips by the AC Transit 65 line to the Lawrence Hall of Science would occur occasionally as well as the H line provided by UCB's Parking and Transportation department at 30-minute intervals. The anticipated 5-minute maximum road closures would not significantly delay these transit vehicles.

Since no workers are expected to take transit and since transit vehicles along roads near the proposed actions would see only minor delays, no significant public transit impacts are expected as part of UCB's proposed and connected actions.

5.13.3.3.3 Oakland

Because public transit near Oakland's proposed project areas is minimal, the proposed and connected actions would have no significant impact on public transit.

5.13.3.4 Effects on Nonmotorized Transportation

The proposed and connected actions would adversely affect non-motorized transportation, primarily bicycle and pedestrian, should implementation or maintenance of the actions interfere with access to trails, roads, and walkways.

5.13.3.4.1 EBRPD

EBRPD does not expect any recreational trails adjacent to or near the proposed and connected project areas to be closed. Staging and landings for equipment at each park and preserve would occur along roads or other locations off of existing park trails. In addition, bicycle traffic along public roads near each project area during expected working hours is minimal. The delays that potentially could be created by equipment access and staging would be insignificant. Therefore, nonmotorized transportation would not be significantly affected by the proposed and connected actions.

5.13.3.4.2 UCB

UCB expects that most trails or roads adjacent to or near its proposed project areas would not be closed, with the exception of the Upper Jordan Fire Trail in Frowning Ridge-PDM, which is

proposed to be closed to the general public during implementation. This trail would see very little use during expected working hours because it is primarily used for recreational purposes on weekends. Staging and landings for equipment at each project area would be along roads or other locations off of existing trails. Because of steep topography, bicycle traffic along public roads near each project area during expected working hours is minimal. The delays that potentially could be created by equipment access and staging would be insignificant. Therefore, nonmotorized transportation would not be significantly affected by the UCB components of the proposed action.

5.13.3.4.3 Oakland

Oakland may temporarily close the major trail connecting the Caldecott Ballfields in the proposed Caldecott Tunnel-PDM project area with the water tank at the edge of the residential area to the southeast. Oakland does not expect any other recreational trails adjacent to or near the proposed and connected project areas to be closed. Staging and landings for equipment at each park and preserve would occur along roads or other locations off of existing fire trails. In addition, bicycle traffic along public roads near each project area during expected working implementation hours is minimal. The delays that potentially could be created by equipment access and staging would be insignificant. Therefore, nonmotorized transportation would not be significantly affected by the proposed and connected actions.

5.13.4 Avoidance and Mitigation Measures

Adequate warnings to motorists, pedestrians, and bicycle riders must be provided whenever a road or trail is blocked, partially blocked, or closed. It is expected that flag control warning crews would be used whenever trucks enter or exit public roadways onto adjacent fire trails and landings, large pieces of debris nearby would potentially affect the roadway, or equipment is placed at the project area sites.

5.14 Noise

The focus of this analysis is on potential temporary and long-term impacts to local noise-sensitive receptors near the proposed and connected project areas. Noise-sensitive receptors near the project areas include homes, schools, and outdoor recreational facilities that are not normally noisy. The primary potential source of increases in noise levels is equipment used in implementing the proposed and connected actions.

The noise level at nearby sensitive receptors during implementation of the proposed and connected actions was calculated by making a distance adjustment to the sound level at the noise source and logarithmically adding the distance-adjusted noise level from action implementation to the ambient noise level. Noise from the proposed and connected actions was predicted using the equations and guiding principles from the Federal Highway Administration (FHWA) Roadway Construction Noise Model. The database associated with the model provides maximum noise levels for various pieces of equipment at a reference distance of 50 feet. Noise would generally occur from two sources: access road construction and implementation of the proposed and connected actions. Additionally, onsite mechanical maintenance would require the use of air compressors to run pneumatic tools. The types of equipment that could be used during action implementation, the percentage of time the equipment would operate during a typical workday, and each piece's maximum noise level are presented in Table 5.14-1. The work is anticipated to occur only during weekdays and during daylight hours.

Table 5.14-1. Equipment Types and Noise Levels

Equipment Type	Noise Source	Acoustical Usage Factor[(1)]	L_{max} at 50 Feet
Air compressors	Equipment maintenance	40%	78
Chainsaws	Proposed and connected action	20%	84
Chippers/Stump Grinders	Proposed and connected action	50%	85
Dozers (Crawler Tractors)	Access road construction	40%	82
Dump Trucks	Access road construction	40%	76
Fellers/Bunchers	Proposed and connected action	40%	81
Loaders, Rubber Tired	Access road construction	40%	79
Loaders, Skid Steer	Proposed and connected action	40%	79
Log/Chip Haul Trucks	Proposed and connected action	40%	76
Mowers, Rear Engine Riding	Proposed and connected action	50%	85
Skidders	Proposed and connected action	40%	83
Trimmers/Edgers/Brush Cutters	Proposed and connected action	20%	84
Water Trucks	Access road construction	40%	76

Source: FHWA 2006
Notes:
(1) The acoustical usage factor is defined as the fraction of time that the equipment generates noise at the maximum level.
L_{max} = maximum noise level measured during a monitoring period

Because activities that could cause noise impacts would be restricted to daytime hours, potential nighttime noise impacts were not estimated.

For the purpose of this analysis, a proposed action would be adverse if it results in a greater than ten A-weighted decibel (dBA) increase in the 1-hour equivalent sound level (L_{eq}) at the receptor.

This criterion is based on the characteristics of noise. A 10 dBA increase in noise level is perceived as a doubling of noise (FHWA 2011). The significance criteria described above apply to the noise receptors that could be affected by the proposed and connected actions.

5.14.1 No Action Alternative

The no action alternative includes the most likely future conditions in the absence of the proposed and connected actions. Noise levels under the no action alternative would be essentially the same as under existing conditions.

5.14.2 Proposed and Connected Actions

The proposed and connected actions would include creation of access roads and cutting, skidding, chipping, trimming, and scattering of vegetative material. Under the conservative assumptions that all equipment would be operated simultaneously, a significant adverse noise impact would occur within the project areas during initial implementation of the proposed and connected actions. This would affect people using the project areas for recreation unless people are excluded from the project areas and adjacent recreation areas while work is in progress.

Noise impacts outside the project areas would vary with distance. For each proposed and connected project area, Table 5.14-2 shows an estimate of the maximum noise impact at the nearest sensitive receptor outside the project area. In the case of EBRPD actions, this means the nearest sensitive receptor outside the park or preserve. In most cases, the nearest sensitive receptor is a private home. In several cases, the nearest sensitive receptor is a non-EBRPD recreational facility. For proposed project area AC003, the nearest sensitive receptor is Skyline High School in Oakland. Detailed calculations of noise impacts are provided in Appendix I.

Table 5.14-2. Summary of Noise Impacts

Park/Location	Polygon	Action	Daytime Increase Over Existing (dBA)	Adverse Impact?
Claremont-PDM	n/a	Proposed	8	No
Strawberry Canyon-PDM	n/a	Proposed	33	**Yes**
Frowning Ridge-PDM	n/a	Proposed	33	**Yes**
Caldecott Tunnel-PDM	n/a	Proposed	17	**Yes**
North Hills-Skyline-PDM	n/a	Proposed	33	**Yes**
Anthony Chabot Regional Park	AC001	Proposed	25	**Yes**
Anthony Chabot Regional Park	AC002	Proposed	30	**Yes**
Anthony Chabot Regional Park	AC003	Proposed	23	**Yes**
Anthony Chabot Regional Park	AC006	Proposed	31	**Yes**
Anthony Chabot Regional Park	AC007	Proposed	15	**Yes**
Anthony Chabot Regional Park	AC011	Proposed	5	No
Anthony Chabot Regional Park	AC012	Proposed	3	No
Anthony Chabot Regional Park	AC013	Proposed	1	No
Anthony Chabot Regional Park	AC014	Proposed	0	No
Anthony Chabot Regional Park	AC001	Connected	29	**Yes**
Anthony Chabot Regional Park	AC006	Connected	32	**Yes**
Anthony Chabot Regional Park	AC007	Connected	34	**Yes**
Anthony Chabot Regional Park	AC010	Connected	1	No

Table 5.14-2. Summary of Noise Impacts

Park/Location	Polygon	Action	Daytime Increase Over Existing (dBA)	Adverse Impact?
Anthony Chabot Regional Park	AC011	Connected	8	No
Anthony Chabot Regional Park	AC012	Connected	1	No
Anthony Chabot Regional Park	AC013	Connected	4	No
Anthony Chabot Regional Park	AC014	Connected	0	No
Claremont Canyon Regional Preserve	CC001	Proposed	33	**Yes**
Claremont Canyon Regional Preserve	CC003	Proposed	32	**Yes**
Claremont Canyon Regional Preserve	CC006	Proposed	29	**Yes**
Claremont Canyon Regional Preserve	CC007	Proposed	22	**Yes**
Claremont Canyon Regional Preserve	CC008	Proposed	16	**Yes**
Claremont Canyon Regional Preserve	CC010	Proposed	31	**Yes**
Claremont Canyon Regional Preserve	CC012	Proposed	32	**Yes**
Claremont Canyon Regional Preserve	CC001	Connected	26	**Yes**
Claremont Canyon Regional Preserve	CC002	Connected	31	**Yes**
Claremont Canyon Regional Preserve	CC003	Connected	21	**Yes**
Claremont Canyon Regional Preserve	CC004	Connected	8	No
Claremont Canyon Regional Preserve	CC005	Connected	23	**Yes**
Claremont Canyon Regional Preserve	CC008	Connected	10	No
Claremont Canyon Regional Preserve	CC009	Connected	31	**Yes**
Claremont Canyon Regional Preserve	CC010	Connected	12	**Yes**
Claremont Canyon Regional Preserve	CC011	Connected	16	**Yes**
Huckleberry Botanic Regional Preserve	HP001	Proposed	22	**Yes**
Huckleberry Botanic Regional Preserve	HP002	Proposed	29	**Yes**
Huckleberry Botanic Regional Preserve	HP003	Proposed	29	**Yes**
Huckleberry Botanic Regional Preserve	HP004	Proposed	29	**Yes**
Huckleberry Botanic Regional Preserve	HP004	Connected	26	**Yes**
Lake Chabot Regional Park	LC010	Proposed	29	**Yes**
Leona Canyon Regional Open Space Preserve	LE005	Proposed	29	**Yes**
Miller/Knox Regional Shoreline	MK001	Proposed	32	**Yes**
Miller/Knox Regional Shoreline	MK002	Proposed	28	**Yes**
Miller/Knox Regional Shoreline	MK003	Proposed	10	No
Miller/Knox Regional Shoreline	MK004	Proposed	18	**Yes**
Miller/Knox Regional Shoreline	MK005	Proposed	24	**Yes**
Redwood Regional Park	RD001	Proposed	16	**Yes**
Redwood Regional Park	RD002	Proposed	25	**Yes**
Redwood Regional Park	RD003	Proposed	18	**Yes**
Redwood Regional Park	RD004	Proposed	33	**Yes**
Redwood Regional Park	RD005a	Proposed	2	No
Redwood Regional Park	RD005b	Proposed	5	No
Redwood Regional Park	RD009	Proposed	11	**Yes**
Redwood Regional Park	RD011	Proposed	33	**Yes**
Redwood Regional Park	RD001	Connected	30	**Yes**
Redwood Regional Park	RD003	Connected	5	No
Redwood Regional Park	RD004	Connected	26	**Yes**
Redwood Regional Park	RD008	Connected	30	**Yes**
Redwood Regional Park	RD009	Connected	12	**Yes**
Sibley Volcanic Regional Preserve	SR001	Proposed	30	**Yes**

Table 5.14-2. Summary of Noise Impacts

Park/Location	Polygon	Action	Daytime Increase Over Existing (dBA)	Adverse Impact?
Sibley Volcanic Regional Preserve	SR003	Proposed	33	**Yes**
Sibley Volcanic Regional Preserve	SR004	Proposed	29	**Yes**
Sibley Volcanic Regional Preserve	SR005	Proposed	33	**Yes**
Sibley Volcanic Regional Preserve	SR002a	Connected	33	**Yes**
Sibley Volcanic Regional Preserve	SR002b	Connected	33	**Yes**
Sibley Volcanic Regional Preserve	SR003	Connected	30	**Yes**
Sibley Volcanic Regional Preserve	SR005	Connected	20	**Yes**
Sibley Volcanic Regional Preserve	SR006	Connected	11	**Yes**
Sibley Volcanic Regional Preserve	SR007	Connected	18	**Yes**
Sobrante Ridge Regional Preserve	SO001	Proposed	30	**Yes**
Tilden Regional Park	TI006	Proposed	30	**Yes**
Tilden Regional Park	TI012	Proposed	33	**Yes**
Tilden Regional Park	TI013	Proposed	21	**Yes**
Tilden Regional Park	TI014	Proposed	4	No
Tilden Regional Park	TI015	Proposed	2	No
Tilden Regional Park	TI016	Proposed	22	**Yes**
Tilden Regional Park	TI022	Proposed	5	No
Tilden Regional Park	TI006	Connected	17	**Yes**
Tilden Regional Park	TI008a	Connected	18	**Yes**
Tilden Regional Park	TI008b	Connected	12	**Yes**
Tilden Regional Park	TI009	Connected	30	**Yes**
Tilden Regional Park	TI010	Connected	30	**Yes**
Tilden Regional Park	TI011	Connected	30	**Yes**
Tilden Regional Park	TI012	Connected	21	**Yes**
Tilden Regional Park	TI014	Connected	3	No
Tilden Regional Park	TI015	Connected	2	No
Tilden Regional Park	TI018	Connected	5	No
Tilden Regional Park	TI019	Connected	2	No
Tilden Regional Park	TI020	Connected	22	**Yes**
Tilden Regional Park	TI021	Connected	5	No
Wildcat Canyon Regional Park	WC003	Proposed	33	**Yes**
Wildcat Canyon Regional Park	WC004	Proposed	34	**Yes**
Wildcat Canyon Regional Park	WC009	Proposed	29	**Yes**
Wildcat Canyon Regional Park	WC010	Proposed	30	**Yes**
Wildcat Canyon Regional Park	WC011	Proposed	29	**Yes**
Wildcat Canyon Regional Park	WC005	Connected	33	**Yes**
Wildcat Canyon Regional Park	WC006	Connected	27	**Yes**
Wildcat Canyon Regional Park	WC011	Connected	30	**Yes**

In addition to the noise impacts associated with the direct implementation of the fire mitigation measures (e.g., cutting, skidding, chipping, and trimming), noise impacts would also occur from access road construction. Noise impacts would be adverse at all areas with access road construction except for Claremont Canyon Regional Preserve. Detailed calculations are provided in Appendix I.

Contra Costa County and the cities of Oakland, Berkeley, and Richmond have quantitative standards for construction noise. The maximum noise levels predicted at the sensitive receptors nearest many of the proposed and connected project areas would exceed these noise standards and would be significantly adverse. Noise impacts would be temporary, and the maximum noise levels shown in Table 5.14-2 would only occur when work was performed in the portion of the project area closest to the nearest sensitive receptor.

Mitigation measures would be implemented but would not reduce outdoor noise impacts to less than significant levels at all sensitive receptors. Noise impacts would remain significant and unavoidable for some outdoor receptors. Avoidance and mitigation measures for noise are addressed in Section 5.14.3.

5.14.3 Avoidance and Mitigation Measures

Each subapplicant would develop a noise control plan for its portion of the proposed and connected actions. The noise control plan would identify procedures for predicting construction noise levels at sensitive receptors prior to beginning work and would describe noise reduction measures required to reduce the increased noise levels to the maximum extent possible. Noise mitigation measures would include but would not be limited to the following:

- Equipment would be maintained to reduce noise levels to the maximum extent possible (e.g., exhaust mufflers).
- Hours of work would be limited to 7:00 a.m. to 7:00 p.m. Monday through Friday and 8:00 a.m. to 5:00 p.m. on Saturday.
- Noise complaints would be addressed promptly by the subapplicant and alternate means of project implementation used when feasible.

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5.15 Unavoidable Adverse Environmental Effects

An EIS must include a discussion of any adverse environmental effects that cannot be avoided should the proposed action be implemented (40 CFR § 1502.16). Unavoidable adverse effects are negative effects that remain after implementation of reasonable mitigation measures. The unavoidable adverse effects of the proposed and connected actions are summarized below. These effects are discussed in detail in other parts of this EIS.

5.15.1 Biological Resources

The proposed and connected actions would cut a large amount of vegetation and damage additional vegetation. Some of the cut and damaged vegetation would be environmentally desirable. Although extensive mitigation measures would be implemented to protect wildlife, some wildlife would inevitably be harmed, including protected species.

5.15.2 Soils

Erosion caused by disturbance of soil and reduction of vegetative cover during implementation of the proposed and connected actions would cause some loss of soil on the hillsides. Soil productivity would be temporarily reduced by wood chips blocking light and by soil nitrogen being tied up in the process of wood chip decomposition. Wood chips would not be spread over more than 20% of each project site.

5.15.3 Air Quality

Sufficient funds are not available to remove all of the cut vegetative material from the project areas, and leaving the cut material in the project areas would defeat the purpose of reducing the amount of flammable fuel available to a wildfire. Some cut material would need to be burned, and the resulting air pollution would be an unavoidable impact.

5.15.4 Climate and Microclimate

Burning of cut vegetative material would produce carbon dioxide, the gas primarily responsible for climate change. In areas where trees would be cut, it is likely that the growing season would be shortened because of decreased fog drip during the summer. Cutting of trees on ridgelines would cause an increase in wind speed downwind of the ridgelines.

5.15.5 Aesthetics and Visual Quality

Significant adverse visual impacts would occur in two areas in Tilden Regional Park: the area of the Herschell-Spillman merry-go-round and on the Selby Trail near the access point on Summit Road in Berkeley. Lesser aesthetic effects would occur in other areas. Wood chips would be spread on up to 20% of many project areas and would require an estimate between 5 and 10 years to decompose.

5.15.6 Human Health and Safety

Herbicides would be used to suppress regrowth of cut vegetation. Herbicide use in the proposed and connected actions would be subject to numerous limitations and would incorporate best management practices. No significant impact on human health is anticipated, but some impact is

probably unavoidable in a series of projects employing many workers to manage vegetation in more than 2,000 acres.

5.15.7 Recreation

Several recreational trails would be closed temporarily during implementation of the proposed and connected actions.

5.15.8 Transportation

Roads adjacent to the proposed and connected project areas would have to be closed for periods of up to 30 minutes. Most road closures would occur to facilitate movement of equipment and last no more than 5 minutes. The road closures would occur primarily during initial implementation of the projects rather than during maintenance.

5.15.9 Noise

At times when several pieces of heavy equipment are operating simultaneously, significant noise impacts would occur within the project areas and at the homes closest to many of the project areas. These impacts would occur primarily during initial implementation of the projects rather than during maintenance.

5.16 Irreversible and Irretrievable Commitment of Resources

An EIS must contain a discussion of any irreversible or irretrievable commitments of resources that would occur if the proposal were implemented (40 CFR § 1502.16). Irreversible and irretrievable commitment of resources includes alteration or destruction of a resource that cannot be replaced or restored and use of a resource that can only be used for one thing at a time. Because the proposed and connected actions would not involve construction or other development of land, few irreversible or irretrievable commitments of resources would occur.

Erosion caused by disturbance of soil and reduction of vegetative cover during implementation of the proposed and connected actions would cause some loss of soil on the hillsides. The proposed and connected actions would reduce the likelihood of a major wildfire that would cause a greater loss of soil.

The equipment and labor involved in implementing the proposed and connected actions would represent a temporary but irretrievable commitment of resources. Use of fuel in the equipment would be an irreversible commitment of a nonrenewable resource.

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5.17 Relationship Between Short-Term Uses and Long-Term Productivity

An EIS must include a discussion of the relationship between the proposed project's short-term uses of the environment and maintenance and enhancement of the long-term productivity of the environment (40 CFR § 1502.16).

The proposed and connected actions would cut down a large quantity of mostly non-native vegetation and would disturb the surface of the project areas. This would create relatively barren landscapes in some areas in the short term. In the long term, expansion of mainly native vegetation in the project areas would mitigate or reverse aesthetic impacts and would enhance long-term ecological productivity.

Although extensive mitigation measures would be implemented to protect wildlife during implementation of the proposed and connected actions, some wildlife would inevitably be harmed, including protected species. In the long term, conditions would improve for native wildlife that benefits from native habitat. Habitat for the threatened Alameda whipsnake would be enhanced, and growing conditions for pallid manzanita, a threatened plant, would be improved.

Wood chips spread in approximately 20% of each project area would temporarily reduce soil productivity by blocking light and tying up soil nitrogen during decomposition of the chips. The wood chips would not reduce soil productivity in the long term.

The short-term and long-term effects identified above are discussed in detail in other parts of this EIS.

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