ASCENT ENVIRONMENTAL

DRAFT ENVIRONMENTAL IMPACT REPORT

UC Berkeley Hill Campus Wildland Vegetative Fuel Management Plan

State Clearinghouse No. 2019110389

Prepared for:

Berkeley UNIVERSITY OF CALIFORNIA

University of California, Berkeley
Capital Strategies – Physical & Environmental Planning

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EXECUTIVE SUMMARY

This summary is provided in accordance with California Environmental Quality Act Guidelines (State CEQA Guidelines) Section 15123. As stated in Section 15123(a), "an EIR [environmental impact report] shall contain a brief summary of the proposed action and its consequences. The language of the summary should be as clear and simple as reasonably practical." As required by the State CEQA Guidelines, this chapter includes: (1 a summary description of the Wildland Vegetative Fuel Management Plan (WVFMP or Plan), (2 a synopsis of environmental impacts and recommended mitigation measures (Table ES-1), (3 identification of the alternatives evaluated and of the environmentally superior alternative, and (4 a discussion of the areas of controversy associated with the WVFMP.

ES.1 INTRODUCTION

The UC Berkeley Hill Campus, located along the western side of the coastal range in Alameda and Contra Costa Counties known as the East Bay Hills, has a long history of wildfires. The mix of scrub, conifer, and eucalyptus stands makes the area a regular seasonal fire risk. This risk becomes particularly pronounced during the periodic one- to two-day shifts from the normal northwesterly winds to 'Diablo' winds blowing in from the warm, dry regions to the east. Twentieth century Diablo wind fires, including the Berkeley/Oakland firestorms of 1923 and 1991, have burned more than ten times the acreage of normal wind condition fires. More recently, the Grizzly Fire (2017) burned 20 acres in the Hill Campus and required the evacuation of 1,000 people. Given the increasing frequency and severity of wildfires in California, along with the regular occurrence of hot, dry summers; Diablo wind events; and the presence of steep terrain, flammable vegetation, urban development, and limited fire-fighting access, increasing vegetation management to reduce wildfire risk in the Hill Campus is necessary. Wildfire risk reduction in the Hill Campus is a critical component of protecting the health and safety of faculty, staff, students, visitors, and the public at UC Berkeley.

Because of the recurring nature of wildfires in the East Bay hills, the designation of the Hill Campus and surrounding region within a Very High Fire Hazard Severity Zone (VHFHSZ), and close proximity of residential areas to open space areas susceptible to wildfire, wildfire risk reduction efforts in the Hill Campus are also integrated with ongoing regional efforts to remove high hazard fuels and reduce wildfire risk in the East Bay hills. UC Berkeley works closely with internal and external fire management partners for regional wildfire prevention, including the Hills Emergency Forum (HEF), Diablo Firesafe Council, and various neighborhood groups and internal interdisciplinary planning teams. HEF is an interagency organization that provides a forum for building consensus on developing fire safety standards, incident response and management protocols, public education programs, multijurisdictional training, and fire fuel reduction strategies. The Diablo Fire Safe Council is a non-profit organization that provides resources to coordinate public and private landowners in Alameda and Contra Costa Counties to reduce the threat of wildfire. HEF and the Diablo Firesafe Council have partnered with UC Berkeley in the development of the WVFMP; HEF as a technical advisor on the Plan and the Diablo Firesafe Council for community outreach and as a community liaison.

In 2019, the California Department of Forestry and Fire Protection (CAL FIRE) awarded UC Berkeley a grant exceeding $3.6 million for the purpose of implementing hazardous fire fuel reduction projects in the Hill Campus, including those proposed under the WVFMP, recognizing the value of wildfire risk reduction in the Hill Campus to the protection of people, property, and natural resources in the greater East Bay hills.

ES.2 SUMMARY OF THE WILDLAND VEGETATIVE FUEL MANAGEMENT PLAN

The WVFMP directs the treatment of vegetation that could become fire fuel within the UC Berkeley Hill Campus (or Plan Area). The WVFMP serves as one component of UC Berkeley's range of actions to reduce wildfire risk and minimize the potential for harmful effects of wildfire on people, property, and natural resources within the Plan Area. Vegetation treatments described in the Plan are aimed at reducing the volume and arrangement of fuel available for a wildfire, thereby minimizing predicted flame lengths, torching and tree canopy consumption, ember cast (embers traveling by wind to new areas), and the overall size of a wildfire. In addition, vegetation treatments under the WVFMP are intended to provide increased emergency access and evacuation routes within the Plan Area, as well as strategic areas for effective firefighting and fire-retardant applications. To achieve these, the WVFMP includes four vegetation treatment types within the Hill Campus, which would be implemented at various locations in the Plan Area based on the conditions and objectives of treatment at a given site, local assets at risk, ecological conditions, and other factors. The four proposed treatment types are: 1) evacuation support treatments, 2) temporary refuge areas, 3) fuel breaks, and 4) fire hazard reduction. Five vegetation treatment activities would be used singularly or in combination to implement the four vegetation treatment types: 1) manual treatment, 2) mechanical treatment, 3) prescribed broadcast burning, 4) managed herbivory (livestock grazing), and 5) herbicide application. On average, UC Berkeley would implement vegetation treatment activities on 200 acres per year within the Plan Area. Up to 600 acres of the 800-acre Plan Area would be treated under the WVFMP because 200 acres are inaccessible (i.e., in Hamilton Gulch) or not expected to carry fire, due to the lack of vegetative fuels (refer to Appendix A for additional information on the flammability of vegetation types in the Plan Area).

UC Berkeley also proposes specific vegetation treatment projects, which are referred to as the Identified Treatment Projects. The Identified Treatment Projects comprise two fuel break projects, four temporary refuge areas, and three fire hazard reduction projects in designated locations (project areas) within the Plan Area. Fuel breaks (FBs) are proposed on Claremont Ridge (the East-West FB) and between the Hill Campus and the Hearst Gate to the Lawrence Berkeley National Laboratory (LBNL) (the Hearst Gate FB). The temporary refuge areas (TRAs 1-4) are proposed adjacent to Claremont Avenue, in two areas along Jordan Fire Trail, and adjacent to Centennial Drive in the Lawrence Hall of Science parking area. The fire hazard reduction (FHR) projects comprise vegetation treatments in Strawberry Canyon (Strawberry FHR Project), Claremont Canyon (Claremont FHR Project), and in areas along Frowning Ridge (Frowning FHR Project). UC Berkeley would begin implementing these projects immediately following Plan approval and certification of this EIR.

ES.3 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This EIR has been prepared to evaluate the physical environmental effects of the WVFMP, including the Identified Treatment Projects. Table ES-1, presented at the end of this Executive Summary, provides a summary of the program-level and project-level environmental impacts potentially resulting from implementation of the overall WVFMP and from implementation of the Identified Treatment Projects, respectively. The table also identifies the level of significance of each impact before mitigation, mitigation measures proposed to reduce impacts, and the level of significance of the impact after implementation of the mitigation measures for the overall WVFMP and the Identified Treatment Projects.

ES.4 SUMMARY OF ALTERNATIVES EVALUATED

Agencies, organizations, and individuals provided suggestions for alternatives during interagency consultation and review of the Notice of Preparation (NOP). Alternatives were evaluated for consideration in the EIR if they were determined to: (1) accomplish all or most of the project objectives, (2) be potentially feasible (from economic, legal, regulatory, and technological standpoints), and (3) avoid or substantially lessen any significant effects of the WVFMP. Alternatives that meet these evaluation criteria are evaluated in the EIR and are listed below. Additionally, the No Project Alternative was evaluated, as required by CEQA.

- **No Project Alternative** assumes that UC Berkeley would continue to implement treatments through the existing UC Berkeley 2020 Hill Area Fire Fuel Management Program that are covered under UC Berkeley's 2020 Long Range Development Plan (LRDP) EIR. Fewer treatment types and treatment activities would be implemented on fewer acres annually in comparison to the WVFMP. The proposed Identified Treatment Projects would not be implemented.

- **Alternative A: The McBride Plan Alternative** (named for the person suggesting it) would treat 400-500 acres of vegetation in the Hill Campus with a combination of eucalyptus and conifer conversion projects, creation of fuel breaks, maintenance of cleared utility corridors, installation of new fire detecting and suppression infrastructure, and the purchase of new fire detection and suppression equipment.
- **Alternative B: The Reduced Treatment Alternative** would limit treatments to removal of ground fuels, fire ladder components, and small diameter trees using only manual treatment methods. This alternative would implement evacuation route treatments, shaded fuel breaks, and fire hazard reduction treatments within 200 feet of structures and roadways.

ES.4.1 Environmentally-Superior Alternative

With each alternative, there would be environmental tradeoffs; that is, impacts to certain resource areas from an alternative would increase while others would decrease relative to the WVFMP. The No Project Alternative and Alternative B would avoid two significant and unavoidable impacts of the WVFMP, and all alternatives would result in greater impacts than the WVFMP for some resource areas. The No Project Alternative and Alternative B would avoid significant and unavoidable impacts related to air quality because they would not generate smoke and associated air pollutants and odors from prescribed burning, but the same significant and unavoidable impacts to aesthetics, cultural resources, and noise as the WVFMP would occur under these alternatives. Alternative A would not avoid or lessen any of the significant impacts of the WVFMP. In summary, none of the alternatives would avoid all of the significant and unavoidable impacts of the WVFMP, and no alternative would result in a new significant impact that would not also occur under the WVFMP.

The WVFMP would attain all of the basic objectives of the Plan, but would result in potentially significant impacts and require the application of mitigation to reduce some, but not all, of the significant impacts to less than significant levels. Alternative B would be the environmentally superior alternative because, although not all of the significant and unavoidable impacts of the WVFMP would be completely avoided, the use of only manual treatment activities to implement vegetation treatments would reduce impacts to almost every environmental topic and avoid the significant and unavoidable impacts to air quality from prescribed burning. Significant impacts related to noise during treatments would be less under Alternative B relative to the other alternatives because no mechanical treatment activities or prescribed burning would occur. In addition, significant long-term aesthetic impacts would also be less under Alternative B relative to the other alternatives because treatments would take substantially longer to implement and regrowth would occur more rapidly without herbicide use to eliminate undesirable vegetation. However, impacts related to greenhouse gas (GHG) emissions and wildfire would be greater under all of the alternatives, including Alternative B, relative to the WVFMP.

An important consideration in the comparison of alternatives is the degree to which each alternative would meet the primary objective of the Plan: to substantially reduce risk to life, property, and natural resources on the UC Berkeley campus and in the greater East Bay region by managing the amount and continuity of vegetation in the Hill Campus that increases wildland fire hazards. All of the alternatives would reduce wildfire risks through vegetation treatment; however, none would do so as effectively as the WVFMP. Substantial wildfire risk reduction would take much longer to achieve under Alternative B because only manual treatment methods would be used under this alternative; other treatment methods, such as using mechanical equipment, remove vegetation more quickly and efficiently. In addition, treatment maintenance would be less effective without the use of herbicides and managed herbivory, resulting in more regrowth of vegetative fuels in treated areas. Furthermore, no trees over 18 inches in diameter would be removed under Alternative B. Therefore, hazardous trees with risks of falling and blocking evacuation routes would remain in the Plan Area, potentially inhibiting emergency evacuation and fire suppression during a wildfire. Moreover, the location and types of treatments specified in the WVFMP have been carefully reviewed for effectiveness by CAL FIRE in order to provide a grant to UC Berkeley. CAL FIRE indicated in the grant contract that the WVFMP is appropriate in location and scale to achieve the objectives of the Plan. Although Alternative B is the environmentally superior alternative because it would avoid two significant and unavoidable impacts to air quality from prescribed burning, it would not be as effective as the WVFMP at reducing wildfire risks in the Plan Area.

ES.5 AREAS OF CONTROVERSY AND ISSUES TO BE RESOLVED

UC Berkeley distributed the NOP on November 20, 2019, to responsible agencies, trustee agencies, interested parties and organizations, property owners, and individuals that could have interest in the WVFMP. A public scoping meeting was held on Monday, December 2, 2019. The purpose of the NOP and the scoping meeting was to provide notification that an EIR for was being prepared for the WVFMP and to solicit input on the scope and content of the environmental document. Key concerns and issues that were expressed during the scoping process included the following:

- Effectiveness of the WVFMP at reducing fire risk, including from wind-driven fires
- Impacts to public health and the environment from herbicide use
- Impacts to biological resources and water quality from all treatment activities
- Potential for landslides and erosion in treated areas
- Suggestions for alternatives to the WVFMP

These issues are addressed in this EIR. The NOP and a summary of comments received on the NOP are included in Appendix C and Appendix D of this EIR, respectively.

ES.6 INTENDED USES OF THIS EIR

According to the State CEQA Guidelines (Section 15064[f][1]), preparation of an EIR is required whenever a project may result in a significant environmental impact. An EIR is an informational document used to inform public agency decision makers and the general public of the significant environmental effects of a project, identify possible ways to mitigate or avoid the significant effects, and describe a range of reasonable alternatives to the project that could feasibly attain most of the basic objectives of the project while substantially lessening or avoiding any of the significant environmental impacts. Public agencies are required to consider the information presented in the EIR when determining whether to approve a project.

This EIR functions as both a Program EIR and a Project EIR. Upon certification of this EIR, UC Berkeley intends to implement the proposed Identified Treatment Projects mentioned above. Accordingly, this EIR presents a project-level analysis of the proposed Identified Treatment Projects to facilitate review by the UC Regents in its decision-making process.

This document also functions as a Program EIR in accordance with State CEQA Guidelines Section 15168(c) for streamlining later activities. The four vegetation treatment types and five vegetation treatment activities are evaluated for long-term implementation throughout the entire Plan Area at a programmatic level in this EIR. According to Section 15168 of the State CEQA Guidelines, a Program EIR may be prepared on a series of actions that can be characterized as one large project and are related to, among other things, the issuance of general criteria to govern the conduct of a continuing program or individual activities carried out under the same authorizing statutory or regulatory authority, and having generally similar environmental effects that can be mitigated in similar ways. The UC Regents must evaluate the later activities associated with each future vegetation treatment project to determine whether such activities have been analyzed in this EIR. Such evaluations must ascertain whether these future vegetation treatment projects are consistent with the activities contained in the WVFMP and would have effects that were analyzed in the EIR. If the UC Regents find that the impacts were analyzed in the EIR and no new or substantially more severe significant effects could occur or no new mitigation measures would be required for a later treatment project, the project can be found to be within the scope of this EIR. In this circumstance, no additional CEQA documentation would need to be prepared or publicly circulated (State CEQA Guidelines Section 15168[c][2] and [4]). The documentation used to substantiate the "within the scope" finding would provide the substantial evidence required to reach that conclusion. For the WVFMP, this documentation would be provided in the Environmental Checklist for Later Treatment Projects Under the WVFMP (see Appendix B of this EIR). The university may act on the proposed later activity using this documentation and the EIR for CEQA compliance purposes. If the later activity is approved, the university would file a Notice of Determination.

Table ES-1 Summary of Impacts and Mitigation Measures – Overall WVFMP and Identified Treatment Projects

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
Aesthetics and Visual Resources				
Impact AES-1: Result in Short-Term, Substantial Degradation of a Scenic Vista or Visual Character or Quality of Public Views from Treatment Activities Varying degrees of temporary degradation of public views would result during active implementation of vegetation treatment activities under the WVFMP. Herbicide application and managed herbivory would occur intermittently and move throughout a treatment area. These types of activities would not block any views, dominate a viewshed, or significantly disrupt views from a scenic vista. Equipment and vehicles associated with manual and mechanical treatments and prescribed burning as well as smoke from prescribed burning could be visible to public viewers at scenic vistas or other public views. Implementation of EPMs would avoid and minimize visual impacts from the presence of treatment equipment and smoke from prescribed burning. Any temporary degradation of a scenic vista or visual character or quality of the Plan Area would not be substantial; this impact would be less than significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Impact AES-2: Result in Long-Term, Substantial Degradation of a Scenic Vista or Visual Character or Quality of Public Views from Implementation of the Treatment Types Implementation of the proposed vegetation treatment types under the overall WVFMP and the Identified Treatment Projects would result in the removal of trees and other vegetation, and in many cases, eucalyptus trees, which may be considered a visual resource by some viewers. In addition, creation of temporary refuge areas and non-shaded fuel breaks would require the removal of all trees and understory plants, which would create areas of noticeable contrast between the cleared areas and surrounding vegetation and substantially degrade public views. Furthermore, vegetation removal required to implement the vegetation treatment types would need to be maintained; therefore, substantial adverse changes to visual resources and visual character and quality of public views would occur. This impact would be significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	S	**Mitigation Measure AES-2: Conduct Visual Reconnaissance for Prior to Implementing All Treatment Types, and Relocate or Feather and Screen Publicly Visible Treatment Areas** UC Berkeley will conduct a visual reconnaissance of the treatment area before establishing ESTs, FHRs, FBs, and TRAs to observe the surrounding landscape and determine if public viewing locations, including scenic vistas, public trails, and state scenic highways, have views of the proposed treatment area. If none are identified, the treatment may be implemented without additional visual mitigation. If UC Berkeley identifies public viewing points, including heavily used scenic vistas, public trails, recreation areas, with lengthy views (i.e., longer than a few seconds) of a proposed treatment area, UC Berkeley will, before implementation, identify any change in location of the treatment site to reduce its visibility from public viewpoints. If no changes exist that would reduce	SU

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
			impacts to public viewers and achieve the intended wildfire risk reduction objectives of the proposed treatment, UC Berkeley will thin and feather adjacent vegetation to break up the linear edges of treatment areas and strategically preserve vegetation at the edge of the treatment area, to help screen public views and minimize the contrast between the treatment area and surrounding vegetation.	
	Identified Treatment Projects	S	Mitigation Measure AES-2: Conduct Visual Reconnaissance for Prior to Implementing All Treatment Types, and Relocate or Feather and Screen Publicly Visible Treatment Areas	SU
Impact AES-3: Create a New Source of Substantial Light or Glare, Which Would Adversely Affect Day or Nighttime Views of the Area Because the Plan Area is largely undeveloped, exposure of the public to nighttime light or glare as a result of vegetation removal would be unlikely because it would require complete vegetation removal in locations where there are sensitive viewers and existing sources of substantial nighttime light or glare. Many treatment types would thin vegetation as opposed to completely removing it within a discrete area. Additionally, all lights on the university campus must comply with Title 24 California Code of Regulations, Part 6 (California Energy Code, or the Energy Standards) that would minimize light spillage and minimize atmospheric light pollution. Therefore, implementation of the WVFMP would not create a new source of substantial light or glare, and vegetation removal under the WVFMP would not expose the public to substantial existing sources of light or glare, which would adversely affect day or nighttime views on the area. This impact would be less than significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Air Quality				
Impact AQ-1: Generate Emissions of Criteria Air Pollutants and Precursors during Treatment Activities that Would Contribute to the Exceedances of the NAAQS and CAAQS Because all prescribed burns (broadcast burning of vegetation and pile burning) and incineration of biomass by an air curtain burner under the overall WVFMP	Overall WVFMP	S	**Mitigation Measure AQ-1: Limit the Number and Mix of Crews and/or Use Electric Chainsaws for Mechanical and/or Manual Treatment Crews Operating on the Same Day** UC Berkeley shall limit the number and mix of mechanical and manual treatment crews working on the same day in the Plan Area and/or use only	LTSM

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
would comply with BAAQMD Regulation 5, which requires that they follow tailored SMPs and only take place on permissive burn days, the emissions generated by these activities would not result in, or contribute to, nonattainment of the NAAQS or CAAQS for criteria air pollutants or conflict with air quality planning efforts in the region. However, emissions of criteria air pollutants and precursors generated by mechanical and manual treatments under the overall WVFMP, including the Identified Treatment Projects, would likely exceed BAAQMD-established mass daily emission thresholds for ozone precursors and, therefore, result in, or contribute to, the nonattainment status with respect to the NAAQS and CAAQS for ozone in the SFBAAB, including in areas where people reside and work. Such localized exceedances could result from off-road equipment operated during treatment activities and emissions generated by worker commutes and haul trucks. Because of these possible adverse effects to air quality on both a regional level and local level and the resulting health effects that could be experienced by exposed receptors, this impact would be significant for the overall WVFMP and for the Identified Treatment Projects.			electric-powered hand-held chain saws such that the combined levels of ROG or the combined levels of NO_X will not exceed BAAQMD's threshold of 54 lb/day. Prior to the start of mechanical or manual treatment activity involving more than one treatment crew on a single day, UC Berkeley shall develop a plan for ensuring that the combined emissions of ROG or NO_X generated by all the crews that would operate simultaneously on any single day would not exceed 54 lb/day. UC Berkeley shall only allow mechanical or manual treatment activity to occur with a plan in place that ensures emissions of ROG or NO_X would not exceed 54 lb/day. For the purpose of implementing this mitigation, a mechanical crew consists of up to nine workers using up to nine pieces of power equipment, including heavy equipment (e.g., feller/bunchers, masticators); and a manual treatment crew consists of up to 15 workers using up to 15 pieces of handheld power equipment (e.g., chain saws, brush cutters, weed whips). To achieve this, UC Berkeley may determine the number and mix of mechanical and manual treatment crews using the daily emission levels for one crew presented in Table 3.3-5. For instance, UC Berkeley will not allow more than one manual treatment crew to operate on the same day because the combined level of ROG emissions from two manual treatment crews would be 58.8 lb/day, which would exceed BAAQMD's threshold of 54 lb/day. UC Berkeley could allow two mechanical treatment crews to be active on the same day, or allow one mechanical treatment crew and one manual treatment crew to be active on the same day, because the combined level of emissions under these scenarios would not exceed BAAQMD's threshold of 54 lb/day for ROG or NO_X. Rather than, or in combination with, limiting the number and mix of mechanical and manual treatment crews working on the same day to reduce ROG and NO_X emissions below BAAQMD thresholds, UC Berkeley may use electric powered hand-held chain saws instead of petroleum powered chainsaws. The use of electric powered chainsaws would eliminate all ROG and NO_X emissions generated by petroleum-powered chain saws and result in lower daily emissions of ROG and NO_X generated by mechanical and manual treatment crews. Daily emission levels of different treatment crew types using electric chain saws instead of petroleum-powered chain saws are presented in Table 3.3-7. For example, using the daily emission levels presented in Table 3.3-7, UC Berkeley could allow up to two mechanical treatment crews and one manual treatment crew, which would generate combined daily emissions levels of 10.9	

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
			lb/day of ROG and 50.2 lb/day of NO_X. UC Berkeley will only implement these combinations if all the crews would use electric chainsaws in place of any hand-held petroleum powered chain saws. If needed, UC Berkeley will use a mix of multiple treatment crews with and without electric chainsaws if, based on the daily emission levels presented in Table 3.3-5 and Table 3.3-7, the combined levels of ROG and NO_X would not exceed BAAQMD's recommended threshold of 54 lb/day.	
	Identified Treatment Projects	S	Mitigation Measure AQ-1: Limit the Number and Mix of Crews and/or Use Electric Chainsaws for Mechanical and/or Manual Treatment Crews Operating on the Same Day	LTSM
Impact AQ-2: Expose People to Toxic Air Contaminants Emitted by Prescribed Burns and the Related Health Risk Prescribed broadcast burns and pile burns conducted under the WVFMP could result in the short-term exposure of people to concentrations of TACs that would result in an associated acute health risk with a Hazard Index greater than 1.0. If such exposure occurred, this would be a **significant** impact for the overall WVFMP. None of the Identified Treatment Projects would include prescribed broadcast burning or pile burning; therefore, **no impact** would occur.	Overall WVFMP	S	Mitigation Measure AQ-2: Prevent and Minimize Smoke Emissions and Alert the Public of Upcoming Prescribed Burns UC Berkeley shall incorporate all feasible measures to prevent and minimize smoke emissions as part of the precautionary measures required in SMPs, pursuant to BAAQMD Regulation 5 and EPM AQ-1, for the unintended occurrence when a prescribed burn may go out of prescription and adversely affect offsite receptors. Additionally, in accordance with EPM AD-3, UC Berkeley shall alert the public to planned prescribed burns and give them adequate notice to take precautionary measures, such as closing windows or temporarily vacating the area, to reduce the potential for exposure.	SU
	Identified Treatment Projects	NI	No mitigation is required for this impact.	NI
Impact AQ-3: Expose People to Diesel Particulate Matter Emissions and Related Health Risk Because of the short duration of treatment activities and because treatment activity would not take place near the same sensitive receptors for an extended period of time, diesel PM generated by treatment activities would not expose any person to an incremental increase in cancer risk greater than 10 in one million or a Hazard Index of 1.0 or greater. This impact would be less than significant for the overall WVFMP and for the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Impact AQ-4 Expose People to Objectionable Odors from Equipment Exhaust While the use of diesel- and gasoline-fueled machinery and power equipment during treatment activities performed under the Plan could result in temporary emissions of odorous exhaust, it is not anticipated that the levels of exhaust would be excessive, or adversely affect a substantial number of people. This would be a less-than-significant impact for the overall WVFMP and the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Impact AQ-5: Expose People to Objectionable Odors from Smoke During Prescribed Burning Prescribed broadcast burns and pile burns conducted under the Plan could result in the short-term exposure of a substantial number of people to odorous smoke. This would be a **significant** impact for the overall WVFMP. None of the Identified Treatment Projects would include prescribed broadcast burning or pile burning; therefore, **no impact** would occur.	Overall WVFMP	S	**Mitigation Measure AQ-2: Prevent and Minimize Smoke Emissions and Alert the Public of Upcoming Prescribed Burns**	SU
	Identified Treatment Projects	NI	No mitigation is required.	NI
Archaeological, Historical, and Tribal Cultural Resources				
Impact CUL-1: Cause a Substantial Adverse Change in the Significance of Unique Archaeological Resources or Subsurface Historical Resources Three archaeological resources have been recorded within the Plan Area. In addition, it is possible that unique archaeological or subsurface historical resources would be disturbed during treatment activities. Treatment activities that require soil disturbance or prescribed burning have the potential to encounter	Overall WVFMP	S	**Mitigation Measure CUL-1a: Conduct Archaeological Surveys** Before conducting treatment activities that involve ground disturbance or prescribed burning in an area not previously surveyed for cultural resources (refer to Attachment A, Figure 3 of the Cultural Resources Sensitivity Analysis [UC Berkeley 2020] for surveyed areas), UC Berkeley will retain a qualified archaeologist to conduct a field survey for archaeological resources.	LTSM

Impacts	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant		LTSM = Less than significant with mitigation SU = Significant and unavoidable	
unknown unique archaeological resources or subsurface historical resources, which could be inadvertently damaged during treatment activities. This would be a potentially significant impact for the overall WVFMP as well as the Identified Treatment Projects.		If archaeological resources are found during the field survey, the resources will be inventoried using appropriate state record forms and submitted to the NWIC. The resources will be evaluated for NRHP and CRHR significance. If the resources are found to be significant, appropriate measures will be identified by the qualified cultural resource specialist and Native American representatives, implemented at the direction of UC Berkeley, and documented in the project record. Appropriate measures to minimize impacts to significant resources could include avoidance, capping, or data recovery excavations of the finds. Fencing will be installed around any resources to be avoided including a buffer area. Justification will be included for any tribal recommendations that are not implemented. If identified resources cannot be avoided, an archaeological monitor will be present during any ground disturbance or prescribed burning in the vicinity of discovered resources. The monitoring period will be determined by the qualified cultural resource specialist. If the resource is determined to not be significant, or if no resources are present within the project site, no further mitigation would be required unless there is a discovery during a treatment activity. If additional archaeological resources are found during treatment activities, the procedures identified in Mitigation Measure CUL-1b for the discovery of unknown resources will be followed. **Mitigation Measure CUL-1b: Protect Inadvertent Discoveries of Unique Archaeological Resources or Subsurface Historical Resources** If any prehistoric or historic-era subsurface archaeological features or deposits, including locally darkened soil ("midden"), that could conceal cultural deposits, are discovered during treatment activities, all ground-disturbing activity and prescribed burning within 100 feet of the resource will be halted and a qualified cultural resource specialist will assess the significance of the find. If the find is determined to be significant by the qualified cultural resource specialist (i.e., because the find constitutes a unique archaeological resource, subsurface historical resource, or tribal cultural resource), the cultural resource specialist in consultation with Native American representatives will implement appropriate procedures such that the integrity of the resource is protected (i.e., the resource stays intact and complete) and ensure that no additional resources are affected. Procedures could include, but would not be limited to, preservation in place, archival research, subsurface testing, or contiguous block unit excavation and data recovery.	

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
			Mitigation Measure CUL-1c: Avoid and Protect Known Unique Archaeological Resources For archaeological resources that are known or those that are identified during surveys conducted pursuant to Mitigation Measure CUL-1a, and have been determined by a qualified archaeologist to qualify as a unique archaeological resource, they will be appropriately marked and their locations communicated to workers to ensure protection and avoidance. Confidentiality of cultural resources sites will be maintained with minimal disclosure of site locations. If identified resources cannot be avoided, an archaeological monitor will be present during any ground disturbance or prescribed burning in the vicinity of discovered resources.	
	Identified Treatment Projects	S	**Mitigation Measure CUL-1a: Conduct Archaeological Surveys** **Mitigation Measure CUL-1b: Protect Inadvertent Discoveries of Unique Archaeological Resources or Subsurface Historical Resources** **Mitigation Measure CUL-1c: Avoid and Protect Known Unique Archaeological Resources**	LTSM
Impact CUL-2: Cause a Substantial Adverse Change in the Significance of a Tribal Cultural Resource UC Berkeley sent letters to three Native American tribes notifying each that an EIR was being prepared under CEQA, as required by PRC 21080.3. One tribe requested the initiation of tribal consultation. Tribal consultation is ongoing, but not yet complete and could result in the identification of tribal cultural resources as described under PRC Section 21074. Tribal cultural resources may be identified during consultation. Because consultation is ongoing, this impact would be potentially significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	S	**Mitigation Measure CUL-2: Complete Tribal Consultation (PRC Sections 21080.3.1 and 21080.3.2) and Avoid Potential Effects on Tribal Cultural Resources** UC Berkeley will complete tribal consultation pursuant to PRC Sections 21080.3.1 and 21080.3.2. If no tribal cultural resource is identified during consultation, no further mitigation is required. If UC Berkeley determines that a treatment may cause a substantial adverse change to a tribal cultural resource, and measures to protect the resource are not otherwise identified in the consultation process, provisions under PRC Section 21084.3(b) describe mitigation measures that may avoid or minimize the significant adverse impacts. Examples include: 1. Avoidance and preservation of the resources in place, including, but not limited to, designing the treatment to avoid the resources and protect the cultural and natural context. 2. Treating the resource with culturally appropriate dignity taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following: A. Protecting the cultural character and integrity of the resource;	SU

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
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			B. Protecting the traditional use of the resource; C. Protecting the confidentiality of the resource.	
	Identified Treatmen t Projects	S	**Mitigation Measure CUL-2: Complete Tribal Consultation (PRC Sections 21080.3.1 and 21080.3.2) and Avoid Potential Effects on Tribal Cultural Resources**	SU
Impact CUL-3: Disturb Human Remains Ground disturbing activities related to vegetation treatments could unearth previously undiscovered or unrecorded human remains, if they are present. Compliance with California Health and Safety Code Sections 7050.5 and 7052 and California Public Resources Code Section 5097 would make this impact less than significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Biological Resources				
Impact BIO-1: Substantially Affect Special-Status Plant Species Either Directly or Through Habitat Modifications Vegetation treatment activities could result in direct removal or destruction, or indirect death or reduced vigor of special-status plants through habitat modifications. EPMs would minimize impacts; however, treatment activities could inadvertently damage or destroy special-status plants and adversely modify their habitat resulting in reduced growth and reproduction or death and loss of special-status plant occurrences. Because the loss of special-status plants could substantially affect the abundance, distribution, and viability of local and regional populations of these species, this would be a significant impact for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	S	**Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey** During the early planning stages of later treatment projects implemented under the WVFMP, the following measure will apply: A data review and biological reconnaissance survey will be conducted within the treatment area by a qualified biologist prior to initial treatment and treatment maintenance and will be conducted no more than one year prior to the implementation of treatment or maintenance. The qualified biologist must be familiar with the life histories and ecology of species in the San Francisco Bay Area and must have experience conducting field surveys of relevant species or resources, including protocol-level surveys for individual species, if applicable. The data reviewed will include the biological resources setting, species tables, and habitat information in this EIR. It will also include review of the best available, current data for the area, including vegetation mapping data, species distribution/range information, CNDDB, CNPS Inventory of Rare and Endangered Plants of California, relevant Biogeographic Information and Observation System (BIOS) queries, and relevant general and regional plans. BIOS is a web-based system that enables the management and visualization of	LTSM

Impacts	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant		LTSM = Less than significant with mitigation SU = Significant and unavoidable	
		biogeographic data collected by CDFW and partner organizations. The qualified biologist will assess the habitat suitability of the treatment area for all special-status plant and wildlife species as well as sensitive habitats identified as having potential to occur in the Plan Area (refer to Section 3.5.1, "Environmental Setting"), and will identify any wildlife nursery sites (e.g., heron rookeries, bat maternity roosts, monarch overwintering colonies) within the Plan Area. The biologist will provide a letter report to UC Berkeley with evidence to support a conclusion as to whether special-status species and sensitive habitats are present or are likely to occur within the treatment area. ▸ If the reconnaissance survey identifies no potential for special-status plant, wildlife species, or sensitive habitats to occur, UC Berkeley will not be required to apply any additional mitigation measures under Impact BIO-1 through BIO-4. ▸ If the qualified biologist determines that there is potential for special-status species or sensitive habitats to be present within the treatment area, the appropriate biological mitigation measures, identified below, will be implemented. **Mitigation Measure BIO-1b: Conduct Special-Status Plant Surveys and Implement Avoidance Measures and Mitigation** If it is determined that suitable habitat for special-status plant species is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a) the following measures will be implemented: ▸ Prior to implementation of treatment activities and during the blooming period for the special-status plant species with potential to occur in the treatment area (see table below), as determined during implementation of Mitigation Measures BIO-1a, a qualified botanist will conduct protocol-level surveys for special-status plants within the treatment area following survey methods from CDFW's Protocols for Surveying and Evaluating Impacts on Special Status Native Plant Populations and Natural Communities (CDFW 2018). The qualified botanist will 1) be knowledgeable about plant taxonomy, 2) be familiar with plants of the San Francisco Bay Area region, including special-status plants and sensitive natural communities, 3) have experience conducting floristic botanical field surveys as described in CDFW 2018, 4) be familiar with the *California Manual of Vegetation* (Sawyer et al. 2009 or current version, including updated natural communities data at	

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		http://vegetation.cnps.org/), and 5) be familiar with federal and state statutes and regulations related to plants and plant collecting. ▪ If protocol-level surveys, consisting of at least two survey visits (e.g., early blooming season and later blooming season) during a normal weather year, have been completed in the 5 years before implementation of the treatment project and no special-status plants were found, and no treatment activity occurred after the protocol-level survey, treatment may proceed in that area without additional plant surveys. ▸ If special-status plants are not found, the botanist will document the findings in a letter report to UC Berkeley and no further mitigation will be required. ▸ If special-status plant species are found, the plant will be avoided completely, if feasible (i.e., project objectives can still be met). This may include establishing a no-disturbance buffer around the plants and demarcation of this buffer by a qualified biologist or botanist using flagging or high-visibility construction fencing. The size of the buffer will be determined by the qualified biologist or botanist and will be large enough to avoid direct or indirect impacts on the plant. ▸ If special-status plant species are found that cannot be avoided during treatments because the treatment objectives cannot be met if the special-status plant is avoided, the following will be implemented: ▪ The qualified botanist will determine if the special-status plant population will benefit from treatment in the occupied habitat area even though some of the individual plants may be adversely affected during treatment activities. If the qualified botanist determines that treatment activities will be beneficial to a special-status plant population, no compensatory mitigation will be required. For a treatment to be considered beneficial to special-status plants, the qualified botanist will demonstrate that habitat function (i.e., the arrangement and capability of habitat features to provide refuge, foraging, and reproduction habitat to plants and animals, and thereby contribute to the conservation of biological and genetic diversity and evolutionary processes) is expected to improve with implementation of the treatment such that special-status plant populations would expand, regenerate, or display increased vigor after treatment	

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		implementation. This determination will consider and cite scientific studies demonstrating that the species or a similar species has benefitted from increased sunlight from canopy opening, eradication of invasive species, or otherwise reduced competition for resources. This determination will be documented in the survey results letter report. UC Berkeley may consult with CDFW and/or USFWS for technical information regarding this determination. ▪ **Plants with California Rare Plant Rank 1, 2, or 3**. If a qualified botanist determines that treatment activities will not be beneficial to a special-status plant population and the species is not listed under ESA, CESA, or NPPA, the qualified botanist will determine if treatment would substantially reduce the abundance, distribution, and viability of local and regional populations as defined by the loss of special-status plants restriction the range of the plant, or substantial modification of habitat function such that the habitat would be rendered unsuitable. The qualified botanist will demonstrate that the abundance, distribution, and viability of local and regional populations of the specific species found would be maintained with implementation of the treatment; this will be documented in the survey results letter report. If the qualified botanist determines that the abundance, distribution, and viability of local and regional populations will not be maintained with implementation of the treatment, UC Berkeley will prepare a Compensatory Mitigation Plan. ▪ **Federally or State-Listed Plants**. If a qualified botanist determines that treatment activities will not be beneficial to the plant and the species is listed under ESA, CESA, or NPPA, the qualified botanist will determine if treatment would damage or kill listed plants, or adversely modify their habitat resulting in reduced growth and reproduction or death and loss of listed plant occurrences. This determination will be documented in the survey results letter report. If the qualified botanist determines that treatment will damage or kill listed plants, or adversely modify their habitat resulting in reduced growth and reproduction or death and loss of listed plant occurrences, UC Berkeley will prepare a Compensatory Mitigation Plan. ▸ If a Compensatory Mitigation Plan is warranted, the following will be implemented:	

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		▪ The Compensatory Mitigation Plan will describe the appropriate conservation measures and compensatory mitigation strategy being implemented to compensate for unavoidable losses of special-status plants. The plan will address direct and indirect impacts that could occur as a result of treatment activities and will implement the conservation measures and compensatory mitigation to ensure that treatment will not result in a net loss of the special-status plant. Conservation measures and compensatory mitigation may include preserving and enhancing existing populations, creating off-site populations on mitigation sites through seed collection or transplantation, and/or restoring or creating suitable habitat, and must meet the success criteria described below. If the special-status plant taxa are listed under ESA, CESA, or NPPA, the plan will be submitted to CDFW and/or USFWS (as appropriate) for review and comment. ▪ Success criteria for preserved and compensatory populations would include: • The extent of occupied area and plant density (number of plants per unit area) in compensatory populations would be equal to or greater than the affected occupied habitat. • Compensatory and preserved populations would be self-producing. Populations would be considered self-producing when: • plants reestablish annually for a minimum of five years with no human intervention such as supplemental seeding; and • reestablished and preserved habitats contain an occupied area and flower density comparable to existing occupied habitat areas in similar habitat types in the treatment area vicinity. • If off-site conservation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures would be included in the plan, including information on responsible parties for long-term management, conservation easement holders, long-term management requirements, success criteria such as those listed above and other details, as appropriate to target the preservation of long term viable populations.	

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			• If relocation efforts are part of the Compensatory Mitigation Plan, the plan would include details on the methods to be used, including collection, storage, propagation, receptor site preparation, installation, long-term protection and management, monitoring and reporting requirements, success criteria such as those listed above, and remedial action responsibilities should the initial effort fail to meet long-term conservation requirements.	
	Identified Treatment Projects	S	**Mitigation Measure BIO-1b: Conduct Special-Status Plant Surveys and Implement Avoidance Measures and Mitigation** This measure will be implemented in all portions of Identified Treatment Projects that have not already been surveyed during 2019 protocol-level surveys for special-status plants (CCCI 2019a) and before treatment maintenance in Identified Treatment Project areas.	LTSM
Impact BIO-2: Substantially Affect Special-Status Wildlife Species Either Directly or Through Habitat Modifications Treatment activities including prescribed broadcast burning, mechanical treatment, manual treatment, managed herbivory, and herbicide treatment, could result in direct or indirect adverse effects on special-status wildlife species. Implementation of EPMs would minimize impacts; however, treatment activities could result in disturbance, injury, or mortality to special-status wildlife species or adverse modifications of habitat. This would be a significant impact for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	S	**Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey** **Mitigation Measure BIO-2a: Conduct Focused Habitat Assessment for Alameda Whipsnake** If it is determined that suitable habitat for Alameda whipsnake is present within a treatment area(e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented during the planning stages for later treatment projects under the WVFMP: ▶ A qualified biologist will conduct a habitat assessment within a treatment area to determine the likelihood of the species to be present. To be qualified, the biologist will: 1) be knowledgeable in Alameda whipsnake life history and ecology, 2) be able to correctly identify Alameda whipsnake and habitats, 3) have experience conducting field surveys of relevant resources, 4) be knowledgeable about state and federal laws regarding the protection of special-status species, and 5) have experience using CDFW's CNDDB. The habitat assessment will include, but will not be limited to: ▪ Identification or verification of the vegetation communities present in the treatment area, using the types presented in Figure 3.5-3 of this EIR; ▪ Consideration of known occurrences within the Plan Area; ▪ Description of the treatment project, including proposed treatment types and treatment activities;	LTSM

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		■ Analysis of the type and likelihood of impacts on Alameda whipsnake as a result of treatment project implementation; and ■ Potential treatment project modifications or additional measures that may avoid and minimize mortality, injury, and disturbance of Alameda whipsnake. ▸ Results of the habitat assessment will be submitted to UC Berkeley for review and consideration. **Mitigation Measure BIO-2b: Implement Alameda Whipsnake Avoidance and Minimization Measures** Regardless of the results of the reconnaissance-level survey required under Mitigation Measure BIO-1a or habitat assessment required under Mitigation Measure BIO-2a, before implementation of treatment projects under the WVFMP, the following measures will be incorporated into project design: ▸ A qualified biologist will conduct a pre-treatment survey for Alameda whipsnake within 24 hours of initiation of initial treatment activities or treatment maintenance in treatment area. In addition, a qualified biologist will conduct a daily pre-activity Alameda whipsnake survey sweep for treatments that require more than one day to implement. If an Alameda whipsnake is observed, the qualified biologist will identify actions sufficient to avoid impacts on the species (e.g., halt work) and to allow it to leave the area on its own volition. ▸ A qualified biologist will monitor all treatment activities. The biologist will monitor the implementation of treatment activities to look for whipsnake and to ensure the measures to avoid impacts on the species are followed. The biologist will monitor truck and equipment access (i.e., the biologist will walk in front of truck or equipment on access roads ordinarily closed to vehicle traffic to look for whipsnake). ▸ UC Berkeley (or contractors) will immediately (i.e., the same day) process (remove completely from the treatment area, chip, gasify, or permanently place within the treatment area for soil stabilization) all cut materials (i.e., brush, stems, slash, and logs) as they are produced to avoid attracting Alameda whipsnake to the vegetation piles. ▸ If processing within the same day is not feasible, UC Berkeley (or contractors) will determine suitable location(s) outside of suitable scrub and directly adjacent woodland/grassland habitat (e.g., within landings or	

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		temporary refuge areas), in coordination with a qualified biologist, for temporary storage of cut materials that cannot be processed immediately. Log trailers could be used as biomass repositories and removed when full. If vegetation must be removed to create a temporary storage location, UC Berkeley (or contractors) will remove understory vegetation first to facilitate visibility of Alameda whipsnake by a qualified biologist, followed by trees. Then, UC Berkeley (or contractors) will install temporary fencing to exclude Alameda whipsnake. If temporary exclusion fencing is installed, UC Berkeley (or contractors) will prepare an exclusion fencing plan that identifies the size and location of temporary staging areas, the fencing materials to be used, installation instructions, and monitoring requirements. ▸ Cut vegetation that will be burned in piles during biomass disposal and utilization will not be placed on top of burrows. Burn piles will be lit from one end (uphill side on slopes) to allow Alameda whipsnakes, that may be using the pile for refuge, to escape. Piles will not be burned during the winter when Alameda whipsnake may be using them as winter retreats (generally November through February or March, as determined by a qualified biologist based on temperature and weather conditions). ▸ In suitable habitat where suitable winter retreats may be present (e.g., within native scrub habitat not degraded by substantial nonnative tree overstory, rock outcrops within approximately 50 feet of scrub habitat), as determined by a qualified biologist, UC Berkeley (or contractors) will avoid ground disturbance and use of heavy equipment during the winter (generally November through February or March, as determined by a qualified biologist based on temperature and weather conditions). ▸ Unless removal is required to meet program objectives, UC Berkeley (or contractors) will avoid uprooting any native species within native scrub habitat, as determined by a qualified biologist, and in other habitat, UC Berkeley (or contractors) will retain native species. Based on the results of the habitat assessment required under Mitigation Measure BIO-2a in this EIR, a qualified biologist will determine if any of the following would occur after implementation of the measures listed above: residual loss of habitat function for Alameda whipsnake; injury or mortality of Alameda whipsnake; or disturbance of Alameda whipsnake that could substantially disrupt essential behavior patterns (e.g., breeding, feeding, or sheltering) to such an extent that injury or mortality is likely. If a qualified	

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		biologist determines that these impacts are unlikely, treatment may proceed. If a qualified biologist determines that loss of habitat function for Alameda whipsnake is likely; injury or mortality of Alameda whipsnake is likely; or disturbance of Alameda whipsnake is likely which could substantially disrupt essential behavior patterns (e.g., breeding, feeding, or sheltering) to such an extent that injury or mortality is likely, after implementing the measures identified above, then additional feasible measures will be implemented, as determined in consultation with a qualified biologist. These measures may include the following (and potentially others not listed below): ▸ UC Berkeley (or contractors) will not conduct treatment activities within 100 feet of scrub habitat in areas where it is likely that Alameda whipsnake could occur, as identified by a qualified biologist. ▸ UC Berkeley (or contractors) will only operate heavy equipment from developed or disturbed areas (e.g., existing roads). ▸ UC Berkeley (or contractors) will limit vegetation removal to trees/clumps of trees and nonnative shrubs (e.g., French broom) that can be removed from developed areas (e.g., established roads) or bare areas (i.e., disturbed areas devoid of vegetation and burrows) without ground disturbance outside the road or bare area. The biological monitor will inspect trees and shrubs for whipsnake immediately before removal. ▸ UC Berkeley (or contractors) will avoid ground disturbance during vegetation removal (i.e., the stump and roots will remain at a height such that ground disturbance is avoided). UC Berkeley (or contractors) will also avoid disturbance of shrub understory and duff, bark, or branches built up at the base of a tree. If disturbance of shrub understory and duff, bark, or branches at the base of the tree is not feasible (i.e., the stump height remains too high to meet fuel-reduction objectives), UC Berkeley (or contractors) may clear duff, bark, or branches built up at the base of the tree by hand only to the extent needed, while allowing for visibility of Alameda whipsnake by the biological monitor, before cutting the tree closer to the base. UC Berkeley (or contractors) will not disturb roots or soil during hand work. ▸ UC Berkeley (or contractors) will avoid disturbance to suitable rock outcrop habitat by maintaining rock and native shrubs within 50 feet of rock outcroppings.	

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		If a qualified biologist determines that disturbance, injury, or mortality of Alameda whipsnake cannot be avoided through implementation of additional measures, then UC Berkeley would consult with CDFW and USFWS before treatment activities occur and implement any additional measures, including avoidance or compensatory actions, determined through consultation and/or required by incidental take authorization to mitigate impacts on Alameda whipsnake pursuant to CESA and ESA. These additional measures may include installation of exclusion fencing around treatment areas, purchase of credits at a conservation bank, creation of additional habitat, adaptive management strategies, and/or long-term monitoring of treated habitat within the Plan Area to determine whether treatment has improved habitat for Alameda whipsnake. No actions that could adversely affect Alameda whipsnake will be allowed if disturbance, injury, or mortality of Alameda whipsnake could result, unless consultation with CDFW and USFWS is completed and additional measures are implemented as required through consultation. **Mitigation Measure BIO-5a: Install Wildlife-Friendly Fencing for Managed Herbivory Treatments** If temporary fencing is required for managed herbivory treatment, a wildlife-friendly fencing design will be used. UC Berkeley will require a qualified biologist to review and approve the design before installation to minimize the risk of wildlife entanglement. The fencing design will meet the following standards: ▶ Minimize the chance of wildlife entanglement by avoiding barbed wire, loose or broken wires, or any material that could impale or snag a leaping animal; and, if feasible, keeping electric netting-type fencing electrified at all times or laid down while not in use. ▶ Charge temporary electric fencing with intermittent pulse energizers. Continuous output fence chargers will not be permitted. ▶ Allow wildlife to jump over easily without injury by installing fencing that can flex as animals pass over it and installing the top wire low enough (no more than approximately 40 inches high on flat ground) to allow adult deer to jump over it. The determination of appropriate fence height will consider slope, as steep slopes are more difficult for wildlife to pass. ▶ Be highly visible to birds and mammals by using high-visibility tape or wire, flagging, or other markers.	

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			Mitigation Measure HYD-1: Establish Watercourse Protection Buffers **Mitigation Measure BIO-2c: Conduct Protocol-Level Surveys for California Red-Legged Frog and Implement Additional Avoidance and Minimization Measures** If it is determined that a treatment area is within 500 feet of the UC Berkeley Botanical Garden pond (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented during the planning stages for later treatment projects under the WVFMP: ▸ Protocol-level surveys for California red-legged frog will be conducted within the pond in accordance with the USFWS "*Revised Guidance on Site Assessments and Field Surveys for the California Red-Legged Frog*" (USFWS 2005). Up to eight surveys will be conducted between January and September, including two day surveys and four night surveys during the breeding season (approximately late November to April) and one day and one night survey during the non-breeding season (July 1–September 30). The survey period will extend over a period of at least six weeks. ▸ If no California red-legged frogs are detected, copies of data sheets, field notes, and all other supporting documentation will be provided to the appropriate USFWS Office for review. If the results of the protocol-level surveys are accepted by USFWS, further mitigation is not required. ▸ If California red-legged frogs are detected within the pond, no additional surveys will be conducted, and UC Berkeley will notify USFWS in writing within three working days of the detection. ▸ If California red-legged frogs are detected within the pond, then treatments within 500 feet of the pond may result in disturbance, injury, or mortality of the species. A qualified biologist will determine if any of the following are likely after implementation of the EPMs and Mitigation Measure HYD-1: residual loss of habitat function for California red-legged frog; injury or mortality of California red-legged frog; or disturbance of California red-legged frog which could substantially disrupt essential behavior patterns (e.g., breeding, feeding, or sheltering) to such an extent that injury or mortality is likely. ▪ If a qualified biologist determines that habitat function for California red-legged frog is likely to be maintained; injury or mortality of California red-legged frog is unlikely; and disturbance of California red-legged frog is not anticipated which could substantially disrupt essential behavior patterns (e.g., breeding, feeding, or sheltering) to such an extent that injury or	

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		mortality is likely, with implementation of the EPMs and Mitigation Measure HYD-1, treatment project implementation may proceed. ▪ If a qualified biologist determines that residual loss of habitat function for California red-legged frog is likely; injury or mortality of California red-legged frog is likely; or disturbance of California red-legged frog is likely which could substantially disrupt essential behavior patterns (e.g., breeding, feeding, or sheltering) to such an extent that injury or mortality is likely, UC Berkeley will consult with USFWS and implement any additional measures determined through consultation and/or required by incidental take authorization. Measures may include but are not limited to seasonal restrictions, exclusion fencing, relocation of frogs, and compensatory mitigation. **Mitigation Measure BIO-2d: Conduct Surveys for Western Pond Turtle, Implement Avoidance Measures, and Relocate Individuals** If it is determined that suitable aquatic or upland habitat for western pond turtle is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented within 24 hours before implementation of treatment activities: ▸ A qualified biologist familiar with the life history of western pond turtle and experience performing surveys for western pond turtle will conduct a focused survey of suitable habitat within the treatment area. If potentially suitable aquatic habitat is present within a treatment area (e.g., creeks, streams, ponds, drainages), upland habitat within approximately 1,500 feet of this aquatic habitat will also be surveyed. The qualified biologist will inspect the treatment area for western pond turtles as well as suitable burrow habitat. ▸ If western pond turtles are not detected during the focused survey, then further mitigation is not required. ▸ If western pond turtles are detected, a no-disturbance buffer of at least 100 feet will be established around any identified nest sites or overwintering sites. A qualified biologist with an appropriate CDFW Scientific Collecting Permit that allows handling of reptiles will be present during treatment activities and will inspect the treatment area before initiation of treatment activities. If western pond turtles are detected, the qualified biologist will move the turtles downstream and out of harm’s way.	

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		Mitigation Measure BIO-2e: Conduct Protocol-level Surveys for Burrowing Owl, Implement Avoidance Measures, and Compensate for Loss of Occupied Burrows If it is determined that suitable habitat for burrowing owl is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented during the planning stages of a treatment project under the WVFMP: ▶ A qualified biologist with familiarity of burrowing owl life history and survey protocols will conduct a burrowing owl habitat assessment in accordance with Appendix C of the *CDFW Staff Report on Burrowing Owl Mitigation* (CDFW 2012, or most current version) (CDFW Staff Report). ▶ If the treatment area does not contain suitable burrowing owl habitat (e.g., ruderal grassland, successional grassland, scrub habitat with sparse shrub cover, mammal burrows or burrow surrogates, friable soil), as determined by the qualified biologist, then further mitigation for burrowing owl is not required. ▶ If the qualified biologist determines that suitable burrowing owl habitat is present within the treatment area, then the qualified biologist will conduct focused breeding and nonbreeding season surveys for burrowing owls in areas of suitable habitat identified during the habitat assessment or reconnaissance-level survey (e.g., ruderal grassland, successional grassland, scrub habitat with sparse shrub cover) on and within 1,500 feet of the treatment area. Surveys will be conducted before the start of treatment activities and in accordance with Appendix D of the CDFW Staff Report. ▶ If no occupied burrows are found, the qualified biologist will submit a letter report documenting the survey methods and results to UC Berkeley and no further mitigation will be required. ▶ If an active burrow is found within 1,500 feet of a treatment area and treatment activities would occur during the nonbreeding season (September 1 through January 31), UC Berkeley will consult with CDFW during treatments. If occupied burrows are present that cannot be avoided or adequately protected with a no-disturbance buffer, a burrowing owl exclusion plan will be developed, as described in Appendix E of the CDFW Staff Report. Burrowing owls will not be excluded from occupied burrows until the project's burrowing owl exclusion plan is approved by CDFW. The	

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		exclusion plan will include a plan for creation, maintenance, and monitoring of artificial burrows in suitable habitat. ▸ If an active burrow is found during the breeding season (February 1 through August 31), occupied burrows will not be disturbed and will be provided with a protective buffer unless a qualified biologist verifies through noninvasive means that either: (1) the birds have not begun egg laying, or (2) juveniles from the occupied burrows are foraging independently and are capable of independent survival. The size of the buffer will depend on the time of year and level of disturbance as outlined in the CDFW Staff Report. The size of the buffer may be reduced if a broad-scale, long-term, monitoring program acceptable to CDFW is implemented so that burrowing owls are not adversely affected. Once the fledglings are capable of independent survival, the owls can be evicted and the burrow can be destroyed per the terms of a CDFW-approved burrowing owl exclusion plan developed in accordance with Appendix E of CDFW Staff Report. ▸ If active burrowing owl nests are found within a treatment area and are destroyed by implementation of treatment activities, UC Berkeley will mitigate the loss of occupied habitat in accordance with guidance provided in the CDFW Staff Report, which states that permanent impacts on nesting, occupied and satellite burrows, and burrowing owl habitat will be mitigated such that habitat acreage and number of burrows are replaced through permanent conservation of comparable or better habitat with similar vegetation communities and burrowing mammals (e.g., ground squirrels) present to provide for nesting, foraging, wintering, and dispersal. UC Berkeley will retain a qualified biologist to develop a burrowing owl mitigation and management plan that incorporates the following goals and standards: ▪ Mitigation lands will be selected based on comparison of the habitat lost to the compensatory habitat, including type and structure of habitat, disturbance levels, potential for conflicts with humans, pets, and other wildlife, density of burrowing owls, and relative importance of the habitat to the species range wide. ▪ If feasible, mitigation lands will be provided adjacent or proximate to the project site so that displaced owls can relocate with reduced risk of injury or mortality. Feasibility of providing mitigation adjacent or proximate to the project site depends on availability of sufficient	

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		suitable habitat to support displaced owls that may be preserved in perpetuity. ▪ If suitable habitat is not available for conservation adjacent or proximate to the project site, mitigation lands will be focused on consolidating and enlarging conservation areas outside of urban and planned growth areas and within foraging distance of other conservation lands. Mitigation may be accomplished through purchase of mitigation credits at a CDFW-approved mitigation bank, if available. If mitigation credits are not available from an approved bank and mitigation lands are not available adjacent to other conservation lands, alternative mitigation sites and acreage will be determined in consultation with CDFW. ▪ If mitigation is not available through an approved mitigation bank and will be completed through permittee-responsible conservation lands, the mitigation plan will include mitigation objectives, site selection factors, site management roles and responsibilities, vegetation management goals, financial assurances and funding mechanisms, performance standards and success criteria, monitoring and reporting protocols, and adaptive management measures. Success will be based on the number of adult burrowing owls and pairs using the site and if the numbers are maintained over time. Measures of success, as suggested in the CDFW Staff Report, will include site tenacity, number of adult owls present and reproducing, colonization by burrowing owls from elsewhere, changes in distribution, and trends in stressors. Mitigation Measure BIO-2f: Conduct Focused Surveys for Nesting Raptors and Other Native Nesting Birds and Implement Protective Buffers If it is determined that suitable habitat for nesting raptors or other native nesting birds, including special-status species (i.e., white-tailed kite, northern harrier, yellow warbler) is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented: ▸ To minimize the potential for loss of nesting raptors and other birds, treatment activities will be conducted during the nonbreeding season (approximately September 1-January 31, as determined by a qualified	

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		biologist), if feasible. If treatment activities are conducted during the nonbreeding season, no further mitigation will be required. ▶ Within 14 days before the onset of treatment activities during the breeding season (approximately February 1 through August 31, as determined by a qualified biologist), a qualified biologist familiar with birds of California and with experience conducting nesting bird surveys will conduct focused surveys for white-tailed kites, northern harrier, other nesting raptors and other native birds and will identify active nests within 500 feet of the site. ▶ Because the nests of yellow warbler are small and difficult to find, occupancy of suitable habitat (i.e., riparian woodland) for this species will be determined by a qualified biologist familiar with the life history of yellow warbler and with experience identifying the calls of yellow warbler. If yellow warblers are observed calling, exhibiting territorial displays, carrying nest materials, carrying prey, or other signs of breeding behavior, the habitat will be considered occupied. ▶ Impacts on nesting birds will be avoided by establishing appropriate buffers around active nest sites identified during focused surveys to prevent disturbance to the nest. Activity will not commence within the buffer areas until a qualified biologist has determined that the young have fledged, the nest is no longer active, or reducing the buffer will not likely result in nest abandonment. An avoidance buffer of 0.25 mile will be implemented for white-tailed kite, in consultation with CDFW. For other species, a qualified biologist will determine the size of the buffer for non-raptor nests after a site- and nest-specific analysis. Buffers typically will be 500 feet for raptors (other than white-tailed kite) and 100 feet for non-raptor species. Factors to be considered for determining buffer size will include presence of natural buffers provided by vegetation or topography, nest height above ground, baseline levels of noise and human activity, species sensitivity, and expected treatment activities. The size of the buffer may be adjusted if a qualified biologist determines that such an adjustment would not be likely to adversely affect the nest. Any buffer reduction for a special-status species (i.e., white-tailed kite, northern harrier, yellow warbler) from the typical size (i.e., 0.25 mile, 500 feet, 100 feet, respectively) will require consultation with CDFW. Periodic monitoring of the nest by a qualified biologist during and after treatment activities will be required if the activity has potential to adversely affect the nest, the buffer has been reduced, or if birds within active nests are showing	

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		behavioral signs of agitation (e.g., standing up from a brooding position, flying off the nest) during treatment activities, as determined by the qualified biologist. ▶ Removal of golden eagle nests is prohibited regardless of the occupancy status under the federal Bald and Golden Eagle Protection Act. If golden eagle nests are found during focused surveys, then the nest tree shall not be removed. Mitigation Measure BIO-2g: Conduct Focused Surveys for Monarch Overwintering Colonies and Implement Avoidance Measures If it is determined that a monarch overwintering colony or suitable overwintering habitat is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented: ▶ To minimize the potential for loss of monarch overwintering colonies, treatment activities within suitable overwintering habitat (e.g., coniferous forest, eucalyptus forest) will be conducted from April through September to avoid the overwintering season (October through March), if feasible. If treatment activities are conducted outside of the overwintering season, no further mitigation will be required. ▶ Within 14 days before the onset of treatment activities between October 1st and March 31st, a qualified biologist familiar with monarchs and monarch overwintering habitat will conduct focused surveys for monarch colonies within suitable habitat in the treatment area and will identify and any colonies found within the treatment area. ▶ Monarch overwintering colonies that are identified within a treatment area will be demarcated with flagging or high-visibility construction fencing to prevent removal of the stand of trees containing the overwintering colony and encroachment by heavy machinery, vehicles, or personnel. Removal of the tree or stand of trees that contains the overwintering colony will not occur until the monarchs have left the area, as determined by a qualified biologist. ▶ If modification or removal of a stand that contains an identified overwintering colony is required to meet treatment objectives and cannot be delayed, UC Berkeley will prepare and implement a site-specific treatment plan for the stand with the goal of maintaining habitat function for the monarch overwintering colony, following feasible recommendations	

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		from *Protecting California's Butterfly Groves Management Guidelines for Monarch Butterfly Overwintering Habitat* (Xerces 2017). Examples of management strategies that could be considered to maintain habitat function include: ▪ remove or trim hazard trees; ▪ selectively remove or trim of trees to create a heterogeneous habitat that provides access to sunlight and shade for monarchs; ▪ maintain suitable wind protection in the stand; and ▪ replace removed trees with native trees in strategic locations to provide additional wind protection. **Mitigation Measure BIO-2h: Conduct Focused American Badger Survey and Establish Protective Buffers** If it is determined that suitable habitat for American badger is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented for treatment projects under the WVFMP: ▶ Within 30 days before commencement of treatment activities, a qualified wildlife biologist with familiarity with American badger and experience using survey methods for the species will conduct focused surveys of suitable habitat within the treatment area to identify any American badger burrows or dens. ▶ If occupied burrows are not found, further mitigation is not required. ▶ If occupied burrows are found, impacts on active badger dens will be avoided by establishing exclusion zones around all active badger dens, the size of which will be determined by the qualified biologist. No treatment activities will occur within the exclusion zone until denning activities are complete or the den is abandoned, as confirmed by a qualified biologist. The qualified biologist will monitor each den once per week to track the status of the den and to determine when it is no longer occupied. When it is no longer occupied, treatment activities within the exclusion zone may occur. **Mitigation Measure BIO-2i: Conduct Focused Noninvasive Surveys for Mountain Lion Dens and Implement Avoidance Measures** If it is determined that potentially suitable den habitat (e.g., caves, other large natural cavities, thickets) for mountain lion is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a) or signs of mountain lion activities are observed (e.g., tracks, scat, carcasses or bones of	

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		prey species), the following measures will be implemented for treatment projects under the WVFMP: ▸ Within at least 30 days before commencement of treatment activities, a qualified wildlife biologist with familiarity with mountain lion and experience using survey methods for the species will conduct focused surveys of suitable habitat within the treatment area to identify any potential mountain lion dens. Potential mountain lion dens include caves, large natural cavities within rocky areas, or thickets deemed appropriate for use by mountain lions based on size and other characteristics (e.g., proximity to human development, surrounding habitat). The qualified wildlife biologist will also survey for signs of mountain lion (e.g., tracks, scat, carcasses or bones of prey species) in the vicinity of the cave, cavity, or thicket to help determine whether the den may be occupied by mountain lions. ▸ If no potential dens are found, no further mitigation is required. ▸ If potential dens are found, further investigation will be required to determine if the den is being used by a mountain lion or another carnivore species (e.g., coyote [*Canis latrans*], bobcat [*Lynx rufus*]). Survey methods will include the use of trail cameras, track plates, hair snares, or other noninvasive methods. Surveys using these noninvasive methods will be conducted for three days and three nights to determine whether the den is occupied by mountain lions. ▪ If the den is determined to be unoccupied by mountain lion, no further mitigation is required. However, dens occupied by another carnivore species will not be disturbed or destroyed while any young are dependent on the den (in compliance with California Fish and Game Code sections on furbearers). ▪ If the den is determined to be occupied by mountain lion, UC Berkeley will notify and consult with CDFW to identify adequate seasonal restrictions and/or no disturbance buffers to avoid disturbance, injury, or mortality of mountain lion. **Mitigation Measure BIO-2j: Conduct Focused Surveys for San Francisco Dusky-Footed Woodrat; Implement Avoidance Measures, or Relocate Nests** If it is determined that suitable habitat (e.g., woodland, forest, scrub) for San Francisco dusky-footed woodrat is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented for treatment projects under the WVFMP:	

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		▸ Within seven days before initiation of treatment activities, a qualified biologist with familiarity with woodrats and experience conducting woodrat surveys will conduct a focused survey for San Francisco dusky-footed woodrat nests within the treatment area, within all associated access roads and staging areas, and within a sufficient buffer surrounding these areas where indirect disturbance could occur, as determined by the qualified biologist. ▸ If no woodrat nests are found during the focused survey, the qualified biologist will submit a letter report summarizing the results of the survey to UC Berkeley, and no further mitigation would be required. ▸ If woodrat nests are detected within the treatment area, the qualified biologist will determine whether the nest is active; this is typically determined through the presence of large amounts of scat. If active woodrat nests are present that can be avoided, the perimeter of these nests will be demarcated with high-visibility construction fencing to prevent accidental encroachment by vehicles, equipment, or personnel. ▸ If active woodrat nests within a treatment area are detected that cannot be avoided, and treatment activities are planned to occur during the woodrat breeding season (April through June), these active nests must be avoided until the end of the breeding season. ▸ If active woodrat nests within a treatment area cannot be avoided, and treatment activities are planned to occur outside of the woodrat breeding season, a qualified biologist in consultation with CDFW will dismantle the woodrat nest by hand, removing the materials layer by layer to allow adult woodrats to escape. If young are discovered during the disassembling process, the qualified biologist will leave the area for at least 24 hours to allow the adult woodrats to relocate their young on their own. ▸ When the disassembly process is completed, the nest materials will be collected and moved to another suitable nearby location to allow for nest reconstruction. Mitigation Measure BIO-2k: Conduct Focused Bat Surveys and Implement Avoidance Measures If it is determined that suitable roost habitat (e.g., woodland, forest, scrub) for pallid bat, Townsend's big-eared bat, or western red bat is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a),	

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			the following measures will be implemented for treatment projects under the WVFMP: ▶ In the early planning stages of treatment projects, a qualified biologist with familiarity with bats and bat ecology, and experience conducting bat surveys will conduct surveys for bat roosts in suitable habitat (e.g., large trees, crevices, cavities, exfoliating bark, bridges, unoccupied buildings) within and adjacent to a treatment area. ▶ If no evidence of bat roosts is found, then no further study will be required. ▶ If evidence of bat roosts is observed, the species and number of bats using the roost will be determined. Bat detectors may be used to supplement survey efforts. A no-disturbance buffer of 250 feet will be established around active pallid bat, Townsend's big-eared bat, or western red bat roosts, and mechanical and manual treatments will not occur within this buffer. Prescribed broadcast burning activities and pile burning within this buffer will be implemented outside of the bat breeding season, which is April 1–August 31.	
	Identified Treatment Projects	S	Mitigation Measure BIO-2b: Implement Alameda Whipsnake Avoidance and Minimization Measures Mitigation Measure BIO-2d: Conduct Surveys for Western Pond Turtle, Implement Avoidance Measures, and Relocate Individuals Mitigation Measure BIO-2e: Conduct Protocol-level Surveys for Burrowing Owl, Implement Avoidance Measures, and Compensate for Loss of Occupied Burrows Mitigation Measure BIO-2f: Conduct Focused Surveys for Nesting Raptors and Other Native Nesting Birds and Implement Protective Buffers Mitigation Measure BIO-2g: Conduct Focused Surveys for Monarch Overwintering Colonies and Implement Avoidance Measures Mitigation Measure BIO-2h: Conduct Focused American Badger Survey and Establish Protective Buffers Mitigation Measure BIO-2i: Conduct Focused Noninvasive Surveys for Mountain Lion Dens and Implement Avoidance Mitigation Measure BIO-2j: Conduct Focused Surveys for San Francisco Dusky-Footed Woodrat; Implement Avoidance Measures, or Relocate Nests Mitigation Measure BIO-2k: Conduct Focused Bat Surveys and Implement Avoidance Measures Mitigation Measure HYD-1: Establish Watercourse Protection Buffers	LTSM

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
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Impact BIO-3: Result in Degradation or Loss of Riparian Habitat or Other Sensitive Natural Communities Vegetation treatment activities could result in loss or degradation of sensitive habitats, including designated sensitive natural communities and riparian habitat. EPMs would minimize impacts; however, treatment activities could still result in a loss of acreage of sensitive natural communities and riparian habitat, eliminate sensitive natural communities or riparian habitat from a treatment area, or reduce their habitat function. Loss or degradation of sensitive natural communities and riparian habitat would be a significant impact for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	S	**Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey** **Mitigation Measure BIO-3a: Conduct Protocol-Level Surveys for Sensitive Natural Communities and Riparian Habitat and Implement Avoidance Measures** If it is determined that sensitive natural communities or riparian habitat may be present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented before treatment: ▸ A qualified botanist will perform a protocol-level survey of the proposed treatment area for sensitive natural communities and sensitive habitats (including riparian habitat) following the CDFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018). Sensitive natural communities will be identified using the best available and current data, including keying them out using the most current edition of *A Manual of California Vegetation* (including updated natural communities data at http://vegetation.cnps.org/), or referring to relevant reports (e.g., reports found on the VegCAMP website). ▸ Before implementation of treatment activities, all sensitive habitats identified during surveys will be flagged or fenced with brightly visible construction flagging and/or fencing under the direction of the qualified biologist and no treatment activities will occur within these areas. Foot traffic by personnel shall also be limited in these areas to prevent the introduction of invasive or weedy species or inadvertent crushing of plants. Periodic inspections during construction shall be conducted by the monitoring biologist to maintain the integrity of exclusion fencing/flagging throughout the period of construction involving ground disturbance. If after implementation of Mitigation Measure BIO-3a sensitive natural communities or riparian habitat are determined to be present within a treatment area and cannot be avoided because the treatment objectives cannot be met if the sensitive natural community or riparian habitat is avoided, the following measures will be implemented: ▸ A qualified botanist with knowledge of the affected sensitive natural community or riparian habitat will review the treatment design and applicable impact minimization measures (potentially including others not	LTSM

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		listed above) to determine if the implementation of the treatment is anticipated to result in a loss of habitat function (i.e., the location, essential habitat features, and species supported are not substantially changed) of the sensitive natural community or riparian habitat. Any loss of acreage of sensitive natural communities with a rarity rank of S1 or S2 would constitute a loss of habitat function. If a qualified botanist determines the habitat function will be maintained, such that the persistence and regeneration of the habitat would not be hindered, no further mitigation will be required. If a qualified botanist determines that the loss or degradation of sensitive natural communities or riparian habitat would result in loss of habitat function after implementing feasible treatment design modifications and impact minimization measures, then Mitigation Measure BIO-3b or Mitigation Measure BIO-3c will be implemented. ▸ The only exception to this mitigation approach is in cases where it is determined by a qualified botanist that the sensitive natural community or riparian habitat would benefit from treatment in the occupied area even though some loss may occur during treatment activities. For a treatment to be considered beneficial to a sensitive natural community or riparian habitat, the qualified botanist will demonstrate that habitat function is reasonably expected to improve with implementation of the treatment such that sensitive natural community or riparian habitat would expand, regenerate, or display increased vigor after treatment implementation. Evidence supporting this conclusion could include citing scientific studies demonstrating that the community or similar community has benefitted from increased sunlight as a result of canopy opening, eradication of invasive species, or otherwise reduced competition for resources. This demonstration will be documented in a letter report to UC Berkeley. If it is determined that treatment activities would be beneficial to sensitive natural communities or riparian habitat, no compensatory mitigation will be required. Mitigation Measure BIO-3b: Compensate for Unavoidable Loss of Sensitive Natural Communities If after implementation of Mitigation Measure BIO-3a sensitive natural communities are determined to be present within a treatment area and loss of habitat function would occur as specified under Mitigation Measure BIO-3a, the following measures will be implemented for treatment projects under the WVFMP:	

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		▸ Compensate for unavoidable loss of any sensitive natural community habitat function such that no net loss of habitat function occurs by: ▪ restoring sensitive natural community habitat function within the treatment area; ▪ restoring degraded sensitive natural communities outside of the treatment area at a sufficient ratio to offset the loss of habitat function; or ▪ preserving existing sensitive natural communities of equal or better value to the sensitive natural community affected through a conservation easement at a sufficient ratio to offset the loss of habitat function. ▸ UC Berkeley will prepare and implement a Compensatory Mitigation Plan that will include the following: ▪ For preserving existing habitat outside of the treatment area in perpetuity, the Compensatory Mitigation Plan will include a summary of the proposed compensation lands (e.g., the number and type of credits, location of mitigation bank or easement), parties responsible for the long-term management of the land, and the legal and funding mechanism for long-term conservation (e.g., holder of conservation easement or fee title). UC Berkeley will provide evidence in the plan that the necessary mitigation has been implemented or that UC Berkeley has entered into a legal agreement to implement it and that compensatory habitat will be preserved in perpetuity. ▪ For restoring or enhancing habitat within the treatment area or outside of the treatment area, the Compensatory Mitigation Plan will include a description of the proposed habitat improvements, success criteria that demonstrate the performance standard of maintained habitat function has been met, legal and funding mechanisms, and parties responsible for long-term management and monitoring of the restored or enhanced habitat. ▪ Success criteria required to maintain habitat function for preserved and compensatory populations would include: • The extent of occupied area and density of plants associated with the sensitive natural community (number of plants per unit area) in compensatory habitats would be equal to or greater than the affected occupied habitat.	

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			• Compensatory and preserved sensitive natural communities would be self-producing. Populations would be considered self-producing when: o Plants associated with sensitive natural communities reestablish annually for a minimum of five years with no human intervention such as supplemental seeding; and o Reestablished and preserved habitats contain an occupied area and density comparable to existing occupied habitat areas in similar habitat types in the treatment area vicinity. **Mitigation Measure BIO-3c: Compensate for Unavoidable Loss of Riparian Habitat** If after implementation of Mitigation Measure BIO-3a riparian habitat is determined to be present within a treatment area and loss of habitat function would occur as specified under Mitigation Measure BIO-3a, the following measures will be implemented for treatment projects under the WVFMP: ▸ UC Berkeley will compensate for unavoidable losses of riparian habitat function such that no net loss of habitat function occurs by: ▪ restoring riparian habitat function within the treatment area; ▪ restoring degraded riparian habitat outside of the treatment area; ▪ purchasing riparian habitat credits at a CDFW-approved mitigation bank; or ▪ preserving existing riparian habitat of equal or better value to the affected riparian habitat through a conservation easement at a sufficient ratio to offset the loss of riparian habitat function. ▸ UC Berkeley will prepare and implement a Compensatory Mitigation Plan that will include the following: ▪ For preserving existing riparian habitat outside of the treatment area in perpetuity, the Compensatory Mitigation Plan will include a summary of the proposed compensation lands (e.g., the number and type of credits, location of mitigation bank or easement), parties responsible for the long-term management of the land, and the legal and funding mechanism for long-term conservation (e.g., holder of conservation easement or fee title). UC Berkeley will provide evidence in the plan that the necessary mitigation has been implemented or that UC Berkeley has entered into a legal agreement to implement it and that compensatory plant populations will be preserved in perpetuity.	

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			▪ For restoring or enhancing riparian habitat within the treatment area or outside of the treatment area, the Compensatory Mitigation Plan will include a description of the proposed habitat improvements, success criteria that demonstrate the performance standard of maintained habitat function has been met, legal and funding mechanisms, and parties responsible for long-term management and monitoring of the restored or enhanced habitat. ▪ Compensatory mitigation may be satisfied through compliance with permit conditions, or other authorizations obtained by UC Berkeley (e.g., Lake and Streambed Alteration Agreement), if these requirements are equally or more effective than the mitigation identified above. **Mitigation Measure HYD-1: Establish Watercourse Protection Buffers**	
	Identified Treatment Projects	S	**Mitigation Measure BIO-3a: Conduct Protocol-Level Surveys for Sensitive Natural Communities and Riparian Habitat and Implement Avoidance Measures and Mitigation** **Mitigation Measure BIO-3b: Compensate for Unavoidable Loss of Sensitive Natural Communities** **Mitigation Measure BIO-3c: Compensate for Unavoidable Loss of Riparian Habitat** **Mitigation Measure HYD-1: Establish Watercourse Protection Buffers**	LTSM
Impact BIO-4: Substantially Adversely Affect State or Federally Protected Wetlands Vegetation treatment activities could result in loss or degradation of state or federally protected wetlands through direct removal of wetland vegetation or alteration of wetland hydrology or topography resulting in loss or degradation of wetland functions. Implementation of EPMs would minimize impacts; however, treatment activities could inadvertently destroy or adversely modify protected wetlands resulting in loss of these resources. Additionally, prescribed broadcast burning would result in direct removal of wetland vegetation that could adversely modify wetland functions. The loss of wetland functions from ground disturbance or upland vegetation removal that alters hydrology, direct removal of wetland vegetation, or fill of wetlands or dredging through wetlands would be a significant impact for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	S	**Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey** **Mitigation Measure BIO-4a: Avoid State and Federally Protected Wetlands** If it is determined that wetland habitat may be present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented before treatment: ▸ A qualified biologist will delineate the boundaries of state or federally protected wetlands within the treatment area according to methods established in the USACE wetlands delineation manual (Environmental Laboratory 1987) and the Arid West regional supplement (USACE 2008). ▸ A qualified biologist will delineate the boundaries of wetlands that may not meet the definition of waters of the United States, but would qualify as waters of the state, according to the state wetland procedures. ▸ A qualified biologist will establish a buffer around wetlands and mark the buffer boundary with high-visibility flagging, fencing, stakes, or clear,	LTSM

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			existing landscape demarcations (e.g., edge of a roadway). The buffer will be a minimum width of 25 feet but may be larger if deemed necessary. The appropriate size and shape of the buffer zone will be determined in coordination with the qualified biologist and will depend on the type of wetland present (e.g., seasonal wetland, wet meadow, freshwater marsh, vernal pool), the timing of treatment (e.g., wet or dry time of year), whether any special-status species may occupy the wetland and the species' vulnerability to the treatment activities, environmental conditions and terrain, and the treatment activity being implemented. ▸ A qualified biologist will periodically inspect the materials demarcating the buffer to confirm that they are intact and visible, and wetland impacts are being avoided. ▸ Within this buffer, herbicide application is prohibited. ▸ Within this buffer, any ground disturbance is prohibited. Accordingly, the following activities are not allowed within the buffer zone: mechanical treatments, managed herbivory, and vehicle access or staging. ▸ Only prescribed burning may be implemented in wetland habitats if it is determined by a qualified biologist that: ▪ No special-status species are present in the wetland habitat. ▪ The wetland functions would be maintained. ▪ The prescribed broadcast burn is within the normal fire return interval for the wetland vegetation types present. ▪ Fire containment lines and pile burning are prohibited within the buffer. ▪ No fire ignition (and associated use of accelerants) will occur within the wetland buffer. Mitigation Measure HYD-1: Establish Watercourse Protection Buffers	
	Identified Treatment Projects	S	Mitigation Measure BIO-4a: Avoid State and Federally Protected Wetlands Mitigation Measure HYD-1: Establish Watercourse Protection Buffers	LTSM
Impact BIO-5: Substantially Interfere with Wildlife Movement Corridors or Impede Use of Nurseries Vegetation treatment activities could be located in areas used as wildlife movement corridors or nurseries. Treatment-related disturbance could lead to temporary	Overall WVFMP	S	Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey Mitigation Measure BIO-2g: Conduct Focused Surveys for Monarch Overwintering Colonies and Implement Avoidance Measures	LTSM

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
changes in migration or movement patterns and fencing for managed herbivory could potentially injure or impede moving wildlife. Wildlife nursery sites could be disturbed or essential nursery habitat components could be degraded by vegetation treatment activities. Temporary shifts in wildlife movements to avoid or navigate around active treatment areas and associated disturbances would not substantially interfere with movement requirements or migration patterns, and project implementation would not create long-term barriers to local or landscape-level movements. However, even with implementation of the EPMs, the temporary use of fencing associated with managed herbivory could result in entanglement resulting in injury or mortality of wildlife if placed within wildlife movement corridors or if used improperly. Additionally, while implementation of EPMs would minimize impacts, nursery sites could still be removed, degraded, or disturbed during treatment activities. This would be a significant impact for the overall WVFMP as well as the Identified Treatment Projects.			**Mitigation Measure BIO-3a: Conduct Protocol-Level Surveys for Sensitive Natural Communities and Riparian Habitat and Implement Avoidance Measures and Mitigation** **Mitigation Measure BIO-3b: Compensate for Unavoidable Loss of Sensitive Natural Communities** **Mitigation Measure BIO-3c: Compensate for Unavoidable Loss of Riparian Habitat** **Mitigation Measure BIO-5a: Install Wildlife-Friendly Fencing for Managed Herbivory Treatments** **Mitigation Measure BIO-5b: Retain Nursery Habitat and Implement Buffers to Avoid Nursery Sites** If it is determined that wildlife nursery sites are present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented before implementation of treatment activities. In addition, if more than one year between completion of the data review and reconnaissance survey from Mitigation Measure BIO-1a has occurred, the data review and reconnaissance survey will be updated to determine if wildlife nursery sites are present within a treatment area: ▸ **Retain Known Nursery Sites.** A qualified biologist will identify the important habitat features of the wildlife nursery and, prior to treatment activities, will mark these features for avoidance and retention during treatment to maintain the function of nursery habitat. ▸ **Establish Avoidance Buffers.** UC Berkeley will establish a no-disturbance buffer around the nursery site if activities are required while the nursery site is active/occupied. The appropriate size and shape of the buffer will be determined by a qualified biologist, based on potential effects of treatment project-related habitat disturbance, noise, visual disturbance, and other factors. No treatment activity will commence within the buffer area until a qualified biologist confirms that the nursery site is no longer active/occupied. Monitoring of the effectiveness of the no-disturbance buffer around the nursery site by a qualified biologist during and after treatment activities will be required. If treatment activities cause agitated behavior of the individual(s), the buffer distance will be increased, or treatment activities modified until the agitated behavior stops. The qualified	

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
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			biologist will have the authority to stop any treatment activities that could result in potential adverse effects to wildlife nursery sites. Mitigation Measure HYD-1: Establish Watercourse Protection Buffers	
	Identified Treatment Projects	S	Mitigation Measure BIO-2g: Conduct Focused Surveys for Monarch Overwintering Colonies and Implement Avoidance Measures Mitigation Measure BIO-3a: Conduct Protocol-Level Surveys for Sensitive Natural Communities and Riparian Habitat and Implement Avoidance Measures and Mitigation Mitigation Measure BIO-3b: Compensate for Unavoidable Loss of Sensitive Natural Communities Mitigation Measure BIO-3c: Compensate for Unavoidable Loss of Riparian Habitat Mitigation Measure BIO-5b: Retain Nursery Habitat and Implement Buffers to Avoid Nursery Sites Mitigation Measure HYD-1: Establish Watercourse Protection Buffers	LTSM
Impact BIO-6: Conflict with Local Policies and Ordinances There are several policies in the City of Berkeley, City of Oakland, Alameda County, and Contra Costa County general plans that protect biological resources. UC Berkeley is not subject to local governments' regulations; however, mitigation measures identified under Impacts BIO-1, BIO-2, BIO-3, BIO-4, and BIO-5 would reduce impacts to resources protected by local policies to less than significant. Therefore, impacts related to potential conflict with local policies or ordinances protecting biological resources would be less than significant for both the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Geology and Soils				
Impact GEO-1: Result in Substantial Erosion or Loss of Topsoil Vegetation treatment activities implemented under the WVFMP may involve the disturbance of soils and the reduction of vegetative cover, which has the potential to substantially increase rates of erosion and loss of topsoil. Mechanical treatments using heavy machinery are the most likely activity to cause soil	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
disturbance which could lead to substantial erosion or loss of topsoil especially in areas of steep slopes. Minor grading of existing landing sites and access roads could also result in erosion as well as dust. Prescribed burning can increase risk of water repellency (Robichaud et al. 2010) and breakdown of soil structure, which can lead to significant increases in erosion. Managed herbivory can also accelerate erosion through creation of trails and exposed soils. The WVFMP would reduce the amount of vegetation in all treated areas, which has the potential to expose soil to wind and water erosion. Implementation of EPMs AQ-2, BIO-7, GEO-1 through GEO-5, and HYD-1 would avoid and minimize the risk of substantial erosion and loss of topsoil. This impact would be less than significant for the overall WVFMP as well as the Identified Treatment Projects.				
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Impact GEO-2: Result in Increased Risk of Landslide Vegetation treatment activities implemented under the WVFMP could increase the risk of landslide by removing the plant root structures which stabilize slopes. Additionally, by removing vegetation, the soil water content could increase due to lack of uptake and transpiration by the vegetation. Higher soil water content could potentially destabilize slopes and increase the risk of landslide. Landslide risk is higher in areas with steeper slopes and where previous landslide has occurred. Implementation of EPMs GEO-2, GEO-3, and GEO-5 would avoid or minimize the risk of landslide resulting from WVFMP treatments. This impact would be less than significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
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Greenhouse Gas Emissions and Climate Change				
Impact GHG-1: Conflict with Applicable Plan, Policy, or Regulation of an Agency Adopted for the Purpose of Reducing the Emissions of GHGs Implementation of the WVFMP, including the Identified Treatment Projects, would be consistent with applicable plans, policies, and regulations aimed at reducing GHG emissions, including California's 2017 Climate Change Scoping Plan, the California Forest Carbon Plan, and the Draft California 2030 Natural and Working Lands Climate Change Implementation Plan. Objectives of the WVFMP include managing the amount and continuity of vegetation in the Hill Campus to reduce the occurrence and severity of future wildfire emissions and increase carbon sequestration. These objectives, and the activities that will be implemented to attain them, would reduce GHG emissions and increase carbon sequestration over the long term. Therefore, this impact would be less than significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
Impact GHG-2: Generate GHG Emissions through Treatment Activities Direct GHG emissions generated by initial treatment of the Plan Area would total approximately 3,183 MTCO2e. On average, vegetation treatment activities would be implemented on 200 acres of the Plan Area each year, emitting approximately 1,061 MTCO2e/year. Annual emissions would be lower in subsequent years because maintenance treatments would be less equipment intensive. Implementation of the Identified Treatment Projects would generate approximately 491 MTCO2e over two years. Implementation of the WVFMP, including the Identified Treatment Projects, would also provide carbon benefits over the long term, including a potential reduction in the occurrence and severity of future GHG-emitting wildfires and carbon sequestration provided by the growth of native vegetation on treated acres. Thus, because implementation of the WVFMP, including the Identified Treatment Projects, would be consistent with plans that address the carbon balance in natural and working lands that are part of state-wide mandates to achieve GHG reductions, the emissions generated by these treatments would not result in a significant impact. For these reasons, the impact of GHG emissions associated with treatment activities would be less than significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Hazards and Hazardous Materials				
Impact HAZ-1: Create a Significant Health Hazard from the Use or Accidental Release of Hazardous Materials Treatment activities proposed under the WVFMP would require the use of equipment and vehicles, which need fuels, oils, and lubricants to operate. The use, transport, and disposal of these substances could result in an accidental release of these hazardous substances into the environment should any leaks or spills occur. EPMs HAZ-1 and HYD-1 require that all equipment be inspected for leaks before the start of treatment activities and fuels, heavy equipment, and other potentially hazardous materials to be kept at a sufficient distance from water courses to provide protection from accidental leaks or spills. These EPMs would minimize leaks and the potential for any leaked substances or spills to enter the environment. Furthermore, UC Berkeley would comply with applicable federal and state laws that regulate the use, transport, storage, and disposal of	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
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hazardous materials, including the HWCA, DTSC's Unified Program, and OSHA and EPA regulations. Although implementation of the WVFMP would increase the amount of treatment activities within the Plan Area and thus increase the use of common hazardous materials in the Plan Area, with implementation of EPMs and adherence to relevant regulations, no significant hazards would be created from the use or accidental release of hazardous materials under the overall WVFMP at both the program- and project-level. This impact would be less than significant for the overall WVFMP as well as the Identified Treatment Projects.				
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Impact HAZ-2: Create a Significant Health Hazard from the Use or Accidental Release of Herbicides Herbicide application under the WVFMP would require increased transportation, use, storage, and disposal of various herbicides, which could result in risks to workers handling the herbicides and to the public (i.e., residents adjacent to treatment areas or recreationists using trails within the Plan Area). Under normal conditions, compliance with all laws, regulations, and herbicide label instructions, along with proper PPE, would prevent significant risks related to human exposure to herbicides. However, potentially adverse effects could occur if an accidental release were to occur or if herbicides were to drift to non-target areas. Several EPMs would be incorporated into the WVFMP to further minimize the potential for accidental release and off-site drift and associated health risks (EPM HAZ-2 through HAZ-6). None of the herbicides proposed for use were found to pose significant risks to applicators or the public based on documented adverse laboratory and field effects to target and non-target organisms after an exposure to a compound given the application techniques and safety precautions included in the WVFMP (refer to Appendix G for additional information). Therefore, implementation of the overall WVFMP and the Identified Treatment Projects would not result in significant increase in health hazards from the use or accidental release of herbicides. This impact would be less than significant.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
Hydrology and Water Quality				
Impact HYD-1: Substantially Degrade Surface or Ground Water Quality Through the Implementation of Prescribed Burning The WVFMP would use broadcast burning and pile burning treatments to reduce fuel loads and to maintain treatment areas. Prescribed burning would occur when conditions favor low severity fires and increased erosion would be minimal. However, the steep terrain and high runoff conditions within the Plan Area create an environment where ash and sediment from burns can be carried long distances and potentially be deposited in watercourses. Burns near watercourses could increase erosion and water temperatures. For these reasons, prescribed burning implemented under the WVFMP could potentially degrade water quality; this impact would be significant. None of the Identified Treatment Projects would include prescribed broadcast burning or pile burning; therefore, no impact would occur.	Overall WVFMP	S	**Mitigation Measure HYD-1: Establish Watercourse Protection Buffers** UC Berkeley will establish watercourse protection buffers (WPBs) as defined below on either side of watercourses within the Plan Area. The buffer system described below is similar to the Watercourse and Lake Protection Zone classification defined in 14 CCR Section 916.5, but has been tailored to local conditions in the Plan Area and specifics of the WVFMP. WPBs will be classified based on the uses of the stream and the presence of aquatic life. Wider WPBs are required for steep slopes. The table below provides a summary of procedures for determining WPB widths. ▸ The following WPB protections will be applied for all treatments: ▪ To protect water temperature, filter strip properties, upslope stability, and fish and wildlife values, the following vegetation retention guidelines will be implemented within WBPs: • Class 1 and 2 watercourses: At least 50 percent of the overstory and 50 percent of the understory canopy covering the ground and adjacent waters will be left in a well distributed multi-storied stand composed of a diversity of species similar to that found before the start of operations. • Class 3 watercourses: At least 50 percent of the total canopy covering the ground will be left in a well distributed multi-storied stand configuration composed of a diversity of species similar to that found before the start of operations. At least 75 percent surface cover and undisturbed area will be retained. ▪ Equipment, including tractors and vehicles, will not be driven in wet areas or WPBs, except over existing roads or watercourse crossings where vehicle tires or tracks remain dry. ▪ Equipment used in vegetation removal operations will not be serviced in WPBs or other wet areas, or in locations that would allow grease, oil, or fuel to pass into lakes, watercourses, or wet areas. ▪ WPBs will be kept free of slash, debris, and other material, including burn piles, that could degrade water quality. Accidental deposits will be removed immediately.	LTSM

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
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			▪ No fire ignition will occur within WPBs however low intensity backing fires may be allowed to enter or spread into WPBs. ▪ Large areas of bare soil within WPBs that are exposed by treatment activities will be stabilized with mulching, grass seeding, or soil stabilizers before the beginning of the rainy season (October 15).	
	Identified Treatment Projects	NI	No mitigation is required for this impact.	NI
Impact HYD-2: Substantially Degrade Surface or Ground Water Quality Through the Implementation of Manual or Mechanical Treatment Activities The WVFMP includes manual and mechanical treatment activities for initial treatments as well as maintenance. All manual and mechanical treatments implemented under the WVFMP would integrate EPMs into treatment design to protect watercourses, limit equipment use on wet soils or steep slopes, stabilize highly disturbed areas, prevent concentration of runoff in non-shaded fuel breaks, and prevent spill or leaks from equipment. Implementation of EPMs would avoid and minimize the risk of substantial degradation to surface or groundwater quality from manual or mechanical treatment activities. This impact would be less than significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Impact HYD-3: Substantially Degrade Surface or Ground Water Quality Through Managed Herbivory Implementation of the WVFMP includes the use of managed herbivory to reduce fuels and would incorporate livestock best management practices which would exclude grazing animals from sensitive areas, limit the duration of grazing, provide alternative water sources, prohibit grazing in saturated soils, and require the relocation of animals when erosion is observed. For these reasons, the risk of substantial degradation to surface or groundwater quality from managed herbivory would be less than significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
None of the Identified Treatment Projects would include managed herbivory; therefore, no impact would occur.				
	Identified Treatment Projects	NI	No mitigation is required for this impact.	NI
Impact HYD-4: Substantially Degrade Surface or Ground Water Quality Through the Application of Herbicides Herbicides would be applied in a targeted manner, by hand, and according to the manufacturer's label directions and consistent with EPMs which limit herbicide use in sensitive areas or under conditions that could lead to misapplication and require each project to be prepared to respond to a spill. Because projects implemented under the WVFMP would integrate these protective measures into treatment design, including for the Identified Treatment Projects, risk of substantial degradation to surface or groundwater quality from herbicide application would be avoided and minimized. This impact would be less than significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Impact HYD-5: Violate Water Quality Standards, Waste Discharge Requirements, or Conflict with the Water Quality Control Plan From WVFMP Implementation All of the treatment activities under the WVFMP have the potential to degrade water quality through erosion and sedimentation (e.g., from mechanical equipment use or managed herbivory) or from the use of hazardous materials (e.g., fuels/oils and herbicides), which would conflict with implementation of the Basin Plan. The WVFMP would avoid significant adverse effects to water quality from manual and mechanical equipment use, managed herbivory, and herbicide application through the incorporation of EPMs and adherence to regulatory requirements protecting water quality. The WVFMP would also use broadcast burning and pile burning treatments to reduce fuel loads and to maintain treatment areas. The steep terrain and high runoff conditions within the Plan Area create an environment where ash and sediment from burns can be carried long distances and potentially be deposited in watercourses. For this reason, prescribed burning implemented under the WVFMP could potentially degrade	Overall WVFMP	S	**Mitigation Measure HYD-1: Establish Watercourse Protection Buffers**	LTSM

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
water quality such that conflict with the Basin Plan would occur; this impact would be significant. The Identified Treatment Projects would be implemented using manual and mechanical treatment activities and herbicide use, and no prescribed burning would occur. Significant adverse effects to water quality from manual and mechanical equipment use and herbicide application would be avoided through the implementation of EPMs and adherence to regulatory requirements protecting water quality. Because no prescribed burning would occur, implementation of the Identified Treatment Projects would not substantially degrade water quality such that conflict with implementation of the Basin Plan. This impact would be less than significant for the Identified Treatment Projects.				
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Noise and Vibration				
Impact NOI-1: Temporarily Expose Residences to a Substantial Increase in Noise Generated by Treatment Activities Approximately 1.2 miles of the 8.9-mile boundary around the Plan Area is adjacent to residential land uses. Manual, mechanical, and prescribed broadcast burning treatment activities occurring near residential land uses could temporarily expose these receptors to noise levels that exceed City of Berkeley or City of Oakland standards, respectively. Some of the Identified Treatment Projects (i.e., Strawberry FHR and East-West FB) are near residences; manual and mechanical treatment activities required for implementation of these treatments could expose residential receptors to noise levels that exceed local standards. In addition, pile burning and chipping or mastication of biomass would use the same types of equipment as broadcast burning and mechanical treatment activities, respectively, and thus would also result in temporary noise levels exceeding local standards. EPMs would help minimize noise levels but would not avoid exceedance of local standards. This impact would be significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	S	**Mitigation Measure NOI-1: Notify Residential and Academic Land Uses** At least three days prior to beginning treatment activities or biomass disposal activities using chainsaws, mechanical equipment, or water tenders, UC Berkeley will provide advanced notice to occupants of residential land uses in the City of Berkeley that are within 215 feet of such activity and occupants of residential land uses in the City of Oakland that are within 135 feet of such treatment activity. At 215 feet noise generated by chainsaws (i.e., the loudest piece of equipment) would attenuate to less than 75 dB L_{eq}, which is the City of Berkeley's noise standard for nonscheduled, intermittent, short-term operation of mobile equipment. At 135 feet noise generated by chainsaws (i.e., the loudest piece of equipment) would attenuate to less than 80 dB Leq, which is the City of Oakland's noise standard for construction-generated noise. Because the distance used for notification is based on the distance required to reduce the noise levels associated with the loudest piece of equipment to below local standards, it would be sufficient to also reduce noise levels associated with the lower volume activities and equipment. Additionally, UC facilities and academic land uses within these noise contours will be notified. Notification will include the dates and hours during which excessive noise generating activities are anticipated to occur and contact information, including a daytime telephone number, of a project representative.	SU

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
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			Recommendations to assist noise-sensitive land uses in reducing interior noise levels (e.g., closing windows and doors) will also be included in the notification.	
	Identified Treatment Projects	S	**Mitigation Measure NOI-1: Notify Residential and Academic Land Uses**	SU
Recreation				
Impact REC-1: Directly or Indirectly Disrupt Recreational Activities Within Designated Recreation Areas Implementation of treatments within the Plan Area could result in potential conflicts with recreationists. Conflicts entail access restrictions or nuisance impacts during treatment including degradation of views, temporary trail closures, noise, dust emissions, and increased traffic that would disrupt the recreational experience. Treatment activities would be temporary and implementation of EPMs would avoid and minimize disruptions to recreation. This impact would be less than significant for the overall WVFMP as well as the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Wildfire				
Impact WIL-1: Substantially Exacerbate Fire Risk and Expose People or Structures to Uncontrolled Spread of a Wildfire Vegetation treatment activities, biomass disposal, and maintenance treatments under the WVFMP could result in risks associated with uncontrolled fire from prescribed burning, as well as from the use of vehicles and heavy machinery in the Plan Area, as each can increase the risk of an accidental wildfire ignition. However, several EPMs would be implemented to reduce the risk of uncontrolled spread of fire from treatment activities and maintenance treatments. In addition, given the extensive preparation and planning before a prescribed burn (e.g., preparation of a SMP and Burn Plan), active monitoring and maintenance during a prescribed burn, and implementation of stringent safety protocols, prescribed burning would not be expected to expose people or structures to the uncontrolled spread of wildfire or otherwise substantially exacerbate fire risk. Furthermore, one of the main objectives of the WVFMP is to reduce the frequency and severity of future uncontrolled	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS

Impacts	Significance before Mitigation		Mitigation Measures	Significance after Mitigation
NI = No impact LTS = Less than significant S = Significant			LTSM = Less than significant with mitigation SU = Significant and unavoidable	
wildfire. This impact would be less than significant for the overall WVFMP as well as the Identified Treatment Projects.				
	Identified Treatment Projects	LTS	No mitigation is required for this impact.	LTS
Impact WIL-2: Expose People or Structures to Substantial Risks Related to Post-Fire Flooding or Landslides The WVFMP does not include new housing nor would it result in substantial unplanned population growth. Therefore, it would not place people or structures in an area with risks related to post-wildfire flooding or landslides. Prescribed burning implemented under the WVFMP, including maintenance treatments, would be low severity and typically retain substantial vegetation, thereby maintaining the stability of the soil. In addition, EPMs would be incorporated into treatments to minimize erosion and minimize landslide potential. Therefore, prescribed burning under the WVFMP would not expose people or structures to substantial risks from post-prescribed burning landslides or flooding. The impact would be less than significant for the overall WVFMP. Furthermore, one of the primary purposes of the WVFMP is to reduce the frequency and severity of wildfire. The intended wildfire risk reduction achieved with implementation of the WVFMP could also result in a reduction in the associated post-wildfire risk of landslides and flooding. As with the overall WVFMP, the Identified Treatment Projects would not place people or structures in an area with risks related to post-wildfire flooding or landslides. The Identified Treatment Projects would not include prescribed burning and are also intended to reduce wildfire risk. Therefore, implementation of the Identified Treatment Projects and maintenance treatments would not have the potential to expose people or structures to substantial risks related to post-fire flooding or landslides. There would be no impact for the Identified Treatment Projects.	Overall WVFMP	LTS	No mitigation is required for this impact.	LTS
	Identified Treatment Projects	NI	No mitigation is required for this impact.	NI

1 INTRODUCTION

This Environmental Impact Report (EIR) evaluates the potential environmental impacts of implementing the proposed Wildland Vegetative Fuel Management Plan (WVFMP or Plan) on the University of California, Berkeley (UC Berkeley or university) Hill Campus. It has been prepared according to the requirements of the California Environmental Quality Act (CEQA) (Public Resources Code [PRC] Section 21000 et seq.) and the State CEQA Guidelines (California Code of Regulations [CCR] Section 15000 et seq.) under the direction of the Regents of the University of California (UC Regents) and in cooperation with UC Berkeley. The UC Regents is the CEQA lead agency.

The proposed WVFMP defines vegetation treatment types and activities that would occur within the Hill Campus to reduce wildfire risks, and is one component of regional wildland vegetative fuel management planning efforts underway to reduce wildfire risk in the East Bay hills. The proposed WVFMP is presented in Appendix A of this EIR.

1.1 UC BERKELEY HILL CAMPUS BACKGROUND

The UC Berkeley Hill Campus (or Plan Area) consists of approximately 800 acres of steep and rugged land and has a history of wildfires. The first known recommendations for fire management planning in the Hill Campus were recorded seven days after the 1923 Berkeley Fire, and several vegetation and fuel management plans have been prepared for the Hill Campus since then. Most recently, in 2003, UC Berkeley developed the 2020 Hill Area Fire Fuel Management Program, which included a variety of vegetation removal activities in the Hill Campus to reduce the risk of wildfire. The UC Berkeley 2020 Long Range Development Plan (2020 LRDP) EIR analyzed the potential environmental impacts associated with the proposed vegetation removal activities, and UC Berkeley has been implementing a variety of the vegetation treatments in the Hill Campus since the EIR was certified.

In 2019, the California Department of Forestry and Fire Protection (CAL FIRE) awarded UC Berkeley a grant exceeding $3.6 million for the purposes of implementing hazardous fire fuel reduction projects in the Hill Campus. Because of changing wildland fire risk reduction practices, UC Berkeley has determined there is a need to update and replace the 2020 Hill Area Fire Fuel Management Program with a new, more comprehensive plan for the Hill Campus to address the increasing frequency and severity of wildfires in the East Bay hills, and increased public and private development threatened by wildfire.

1.2 REGULATORY FRAMEWORK FOR WILDFIRE RISK REDUCTION

Given the history of wildfire in the East Bay hills, wildfire risk reduction is a critical component of protecting the health and safety of faculty, staff, students, visitors, and the public at UC Berkeley. The Plan Area is located entirely within a Local Responsibility Area Very High Fire Hazard Severity Zone (VHFHSZ) as identified by CAL FIRE's most recent Fire and Resource Assessment Program map for the cities of Berkeley and Oakland. The intent of identifying areas with very high fire hazards is to allow CAL FIRE and local agencies to develop and implement measures that would reduce the loss of life and property from uncontrolled wildfires (Government Code Section 51176).

UC Berkeley currently complies with Public Resources Code (PRC) 4291 which mandates defensible space of up to 100 feet around buildings or structures in, upon or adjoining any mountainous, forested, brush- or grass-covered lands. It is UC policy to comply with all applicable federal and state health, safety, and environmental protection laws, regulations and requirements, including those related to emergency planning and fire safety.

Wildfire risk reduction has also been a major focus of recent statewide legislation resulting from the increased frequency and severity of wildfires in California, as evidenced by CAL FIRE wildfire statistics: 15 of the state's 20 largest and most destructive wildfires have occurred since 2002; 10 of the state's 20 deadliest wildfires have occurred since 2003; the 2018 Mendocino Complex, the state's largest wildfire, burned 1.5 times as many acres as the next largest fire; and the 2018 Camp Fire resulted in more than twice as many deaths as the next deadliest fire (CAL FIRE 2019a, 2019b, 2019c). In response to what has been deemed a wildfire crisis in California, former Governor Jerry Brown issued

Executive Order (EO) B-52-18, which mandates a substantial increase in the pace and scale of vegetation treatments in California to reduce wildfire risk; vegetation treatments implemented under the WVFMP would contribute to achieving the mandate set forth by this EO.

1.3 PURPOSE OF THE WILDLAND VEGETATIVE FUEL MANAGEMENT PLAN

The East Bay hills, including the Plan Area, have a long history of wildfires. The mix of scrub, conifer, and eucalyptus stands makes the area a regular seasonal fire risk. This risk becomes particularly pronounced during the periodic one- or two-day shifts from the normal northwesterly winds to 'Diablo' winds blowing in from the warm, dry regions to the east. 20th century Diablo wind fires have burned over ten times the acreage of normal wind condition fires, and include the Berkeley/Oakland firestorms of 1923 and 1991. More recently, the Grizzly Fire (2017) burned 20 acres and required the evacuation of 1,000 people in the Plan Area. Given the increasing frequency and severity of wildfires in California, along with the regular occurrence of hot, dry summers; diablo wind events; and the presence of steep terrain, flammable vegetation, urban development, and limited fire-fighting access in the Plan Area, there is a need to increase vegetation management to reduce wildfire risk in the Hill Campus.

The WVFMP is proposed to treat vegetation that could become fire fuel within the Plan Area and includes vegetation management techniques to improve life safety and reduce losses and damage from wildland fire. The Plan serves as one component of UC Berkeley's range of actions to reduce wildfire risk and minimize the potential for harmful effects of wildfire on people, property, and natural resources within the 800-acre Plan Area. Vegetation treatments described in the Plan are aimed at reducing the volume and arrangement of fuel available for a wildfire, thereby minimizing predicted flame lengths, torching and tree canopy consumption, ember cast (embers traveling by wind to new areas), and the overall size of a wildfire. In addition, vegetation treatments under the WVFMP are intended to provide increased emergency access and evacuation routes within the Plan Area, as well as strategic areas for effective firefighting and fire-retardant applications. To achieve these conditions, the proposed WVFMP includes implementation of four vegetation treatment types across the Hill Campus, which would be implemented at various locations in the Plan Area based on the conditions and objectives of treatment at a given site, local assets at risk, ecological conditions, and other factors. The four proposed treatment types are: 1) evacuation support treatments, 2) temporary refuge areas, 3) fuel breaks, and 4) fire hazard reduction. Five different vegetation treatment activities would be used singularly or in combination to implement the four vegetation treatment types; these are: manual treatment, mechanical treatment, prescribed broadcast burning, managed herbivory, and ground application of herbicides. There are also specific vegetation treatment projects located in discrete locations in the Plan Area that are referred to as the Identified Treatment Projects; UC Berkeley would begin implementing these projects immediately following Plan approval and certification of this EIR. Refer to Chapter 2, "Project Description," for more details regarding the vegetation treatment types, activities, and specific Identified Treatment Projects in the proposed WVFMP.

1.4 REGIONAL WILDLAND VEGETATIVE FUEL MANAGEMENT PLANNING EFFORTS

Given the recurring nature of wildfires in the East Bay hills, the designation of the Plan Area and surrounding region within a VHFHSZ, and close proximity of residential areas to open space areas susceptible to wildfire, there is an ongoing regional effort to remove high hazard fuels and reduce wildfire risk in the East Bay hills. UC Berkeley does not have its own fire department or firefighting capabilities. It relies on response from Oakland Fire Department, Berkeley Fire Department, Moraga-Orinda Fire District, and CAL FIRE. UC Berkeley also works closely with internal and external fire management partners related to regional wildfire prevention, including the Hills Emergency Forum (HEF), Diablo Firesafe Council, and various neighborhood groups and internal interdisciplinary planning teams. HEF is an interagency organization that provides a forum for building consensus on developing fire safety standards, incident response and management protocols, public education programs, multijurisdictional training, and fire fuel reduction strategies. The Diablo Fire Safe Council is a non-profit organization that provides resources to coordinate public and private landowners in Alameda and Contra Costa Counties to reduce the threat of wildfire. HEF and the Diablo Firesafe Council have partnered with UC Berkeley in the development of the WVFMP; HEF as a technical advisor on the Plan and the Diablo Firesafe Council for community outreach and liaison. In addition, the following vegetative fuel management and fire hazard reduction planning documents have been prepared by state and local agencies and municipalities to address wildfire risk in the region (refer to Chapter 4, "Cumulative Impacts" under "Related Projects and Plans" for additional information on these regional efforts):

- City of Oakland Vegetation Management Plan and Environmental Impact Report
- East Bay Regional Park District East Bay Hills Wildfire Hazard Reduction, Resource Management Plan
- East Bay Municipal Utility District Watershed Fire Management Plan
- Alameda County Community Wildfire Protection Plan
- CAL FIRE/Santa Clara Unit Strategic Fire Plan

1.5 PURPOSE AND INTENDED USES OF THIS EIR

According to the State CEQA Guidelines (Section 15064[f][1]), preparation of an EIR is required whenever a project may result in a significant environmental impact. An EIR is an informational document used to inform public agency decision makers and the general public of the significant environmental effects of a project, identify possible ways to mitigate or avoid the significant effects, and describe a range of reasonable alternatives to the project that could feasibly attain most of the basic objectives of the project while substantially lessening or avoiding any of the significant environmental impacts. Public agencies are required to consider the information presented in the EIR when determining whether to approve a project.

CEQA requires that state and local agencies consider the environmental effects of projects over which they have discretionary authority before taking action on those projects (PRC Section 21000 et seq.). CEQA also requires that each public agency avoid or mitigate to less-than-significant levels, wherever feasible, the significant environmental effects of projects it approves or implements. If a project would result in significant and unavoidable environmental impacts that cannot be feasibly mitigated to less-than-significant levels, the project can still be approved, but the lead agency's decision makers must prepare findings and issue a "statement of overriding considerations" explaining in writing the specific economic, social, or other considerations that they believe, based on substantial evidence, make those significant effects acceptable (PRC Sections 21002 and 15093).

This EIR functions as both a Program EIR and a Project EIR. Upon certification of this EIR, UC Berkeley intends to implement the proposed Identified Treatment Projects mentioned above in Section 1.3 and described in detail in Chapter 2, "Project Description," and this EIR presents a project-level analysis of the proposed Identified Treatment Projects to facilitate review by UC Regents.

This document also functions as a Program EIR in accordance with State CEQA Guidelines Section 15168(c) for streamlining later activities. The four vegetation treatment types and five vegetation treatment activities are evaluated for long-term implementation throughout the entire 800-acre Plan Area at a programmatic level in this EIR. According to Section 15168 of the State CEQA Guidelines, a Program EIR may be prepared on a series of actions that can be characterized as one large project and are related to, among other things, the issuance of general criteria to govern the conduct of a continuing program or individual activities carried out under the same authorizing statutory or regulatory authority, and having generally similar environmental effects that can be mitigated in similar ways. The UC Regents must evaluate the later activities associated with each future vegetation treatment project to determine whether such activities have been analyzed in this EIR. Such evaluations must ascertain whether these future vegetation treatment projects are consistent with the activities contained in the WVFMP and would have effects that were analyzed in the EIR. If the UC Regents find that the impacts were analyzed in the EIR and no new or substantially more severe significant effects could occur or no new mitigation measures would be required for a later treatment project, the project can be found to be within the scope of this EIR. In this circumstance, no additional CEQA documentation would need to be prepared or publicly circulated (State CEQA Guidelines Section 15168[c][2] and [4]).

The documentation used to substantiate the "within the scope" finding would provide the substantial evidence required to reach that conclusion. For the WVFMP, this documentation would be provided in the Environmental Checklist for Later Treatment Projects Under the WVFMP (see Appendix B of this EIR). The university may act on the proposed later activity using this documentation and the EIR for CEQA compliance purposes. If the later activity is approved, the university would file a Notice of Determination.

1.5.1 Lead Agency

The UC Regents is the lead agency under CEQA with primary authority to approve the proposed WVFMP, including the Identified Treatment Projects. Before deciding whether to approve or deny the proposed project, the UC Regents (as lead agency), as delegated to UC Berkeley, is required to certify that the EIR has been completed in compliance with CEQA, that the decision makers reviewed and considered the information in the EIR, and that the EIR reflects the independent judgment of the lead agency.

1.5.2 Trustee and Responsible Agencies

A trustee agency is a state agency that has jurisdiction by law over natural resources that are held in trust for the people of the state of California. The California Department of Fish and Wildlife is the only trustee agency with jurisdiction over biological resources potentially affected by the proposed project.

A responsible agency is any public agency, other than the lead agency, which has the responsibility for approving the project, where more than one public agency is involved. Responsible agencies should participate in the lead agency's CEQA process, review the lead agency's CEQA document, and use the document for decision making on project elements over which they have discretionary approval.

The responsible and trustee agencies listed below may have responsibility for, or jurisdiction over, implementation of portions of the proposed project (refer to Section 2.7 in Chapter 2, "Project Description," for a list of required approvals and permits):

- California Department of Fish and Wildlife,
- San Francisco Bay Regional Water Quality Control Board, and
- Bay Area Air Quality Management District.

In addition to these agencies, a federal agency, the U.S. Fish and Wildlife Agency, may have jurisdiction over certain sensitive biological species. While not a responsible or trustee agency under CEQA, this federal agency may use information in this EIR to determine potential environmental impacts under the National Environmental Policy Act.

1.6 PUBLIC INVOLVEMENT

UC Berkeley distributed the Notice of Preparation (NOP) on November 20, 2019, to responsible agencies, trustee agencies, interested parties and organizations, property owners, and individuals that could have interest in the program. UC Berkeley also posted the NOP online at https://capitalstrategies.berkeley.edu/resources-notices/public-notices.

UC Berkeley held a public scoping meeting on Monday, December 2, 2019, to provide information on the proposed WVFMP and solicit public input on the scope and content of the EIR. The scoping meeting was held on the UC Berkeley campus at Julia Morgan Hall. All comments on environmental issues received during the NOP public comment period and at the scoping meeting are considered and addressed in this EIR. The NOP and a summary of comments received on the NOP are presented in Appendix C and Appendix D of this EIR, respectively.

This Draft EIR is being circulated for public review and comment for a period of 45 days from August 14, 2020 to September 28, 2020. During this period, comments from the public, organizations, and agencies on environmental issues may be submitted to UC Berkeley by email or mail carrier to the following address:

Raphael Breines, Senior Planner
Physical & Environmental Planning
University of California, Berkeley
300 A&E Building, Berkeley, CA 94720-1382
Email: planning@berkeley.edu

Upon completion of the public review and comment period, a Final EIR will be prepared that will include written comments on the Draft EIR received during the public review period, responses to those comments, and any revisions to the Draft EIR made in response to public comments. The Draft EIR and Final EIR will comprise the EIR for the proposed project.

1.7 ORGANIZATION OF THE EIR

This EIR is organized as follows:

The "**Executive Summary**": This chapter introduces the Plan; provides a summary of the environmental review process, effects found not to be significant, and key environmental issues; and lists significant impacts and mitigation measures to reduce significant impacts to less-than-significant levels.

Chapter 1, "**Introduction**": This chapter provides a description of the purpose and background of the WVFMP, the regulatory framework and regional wildland vegetative fuel management planning efforts in the East Bay hills, the purpose and intended uses of this EIR, the CEQA public involvement process, and organization of this EIR.

Chapter 2, "**Project Description**": This chapter describes the program objectives and location of the WVFMP, the proposed treatment types and treatment activities that would be implemented under the WVFMP, and the Identified Treatment Projects.

Chapter 3, "**Environmental Impacts and Mitigation Measures**": The sections within this chapter evaluate the expected environmental impacts generated by the Plan, arranged by resource area (e.g., Air Quality, Hydrology and Water Quality). Within each subsection of Chapter 3, the existing conditions, regulatory background, analysis methodology, and thresholds of significance are described. The anticipated changes to the existing conditions after implementation of the Plan are then evaluated for each resource area. For any significant or potentially significant impact that would result from Plan implementation, mitigation measures are presented and the level of impact significance after mitigation is identified.

Chapter 4, "**Cumulative Impacts**": This chapter presents an analysis of the cumulative impacts that would result from implementation of the Plan together with other past, present, and probable future projects.

Chapter 5, "**Other CEQA Sections**": This chapter evaluates the potentially significant and unavoidable impacts, significant and irreversible commitment of resources, and growth-inducing impacts that could result from implementation of the WVFMP.

Chapter 6, "**Alternatives**": This chapter evaluates alternatives to the Plan, including the No Project Alternative and two alternative vegetation treatment options; identifies alternatives considered but eliminated from further consideration; and identifies the environmentally superior alternative.

Chapter 7, "**List of Preparers**": This chapter identifies the preparers of and contributors to the document.

Chapter 8, "**References**": This chapter identifies the references used as sources of information in this EIR.

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2 PROJECT DESCRIPTION

2.1 PLAN OVERVIEW

The Wildland Vegetative Fuel Management Plan (WVFMP or Plan) for the UC Berkeley Hill Campus (Plan Area or Hill Campus) is proposed by the University of California, Berkeley (UC Berkeley or university) to treat vegetation that could become fire fuel within the Plan Area. The WVFMP includes implementation of four vegetation treatment types across the Hill Campus, which are referred to as evacuation support treatments, temporary refuge areas, fuel break treatments, and fire hazard reduction treatments. Five types of vegetation treatment activities are proposed to implement the four vegetation treatment types; these include manual treatment, mechanical treatment, prescribed broadcast burning, managed herbivory (livestock grazing), and targeted ground application of herbicides. These vegetation treatment types and activities are reviewed for use throughout the Plan Area (Figure 2-1). On average, UC Berkeley would implement vegetation treatment activities on 200 acres per year within the Plan Area. Up to 600 acres of the 800-acre Plan Area would be treated under the WVFMP because 200 acres are inaccessible (i.e., in Hamilton Gulch) or not expected to carry fire, due to the lack of vegetative fuel (refer to Appendix A for additional information on the flammability of vegetation types in the Plan Area).

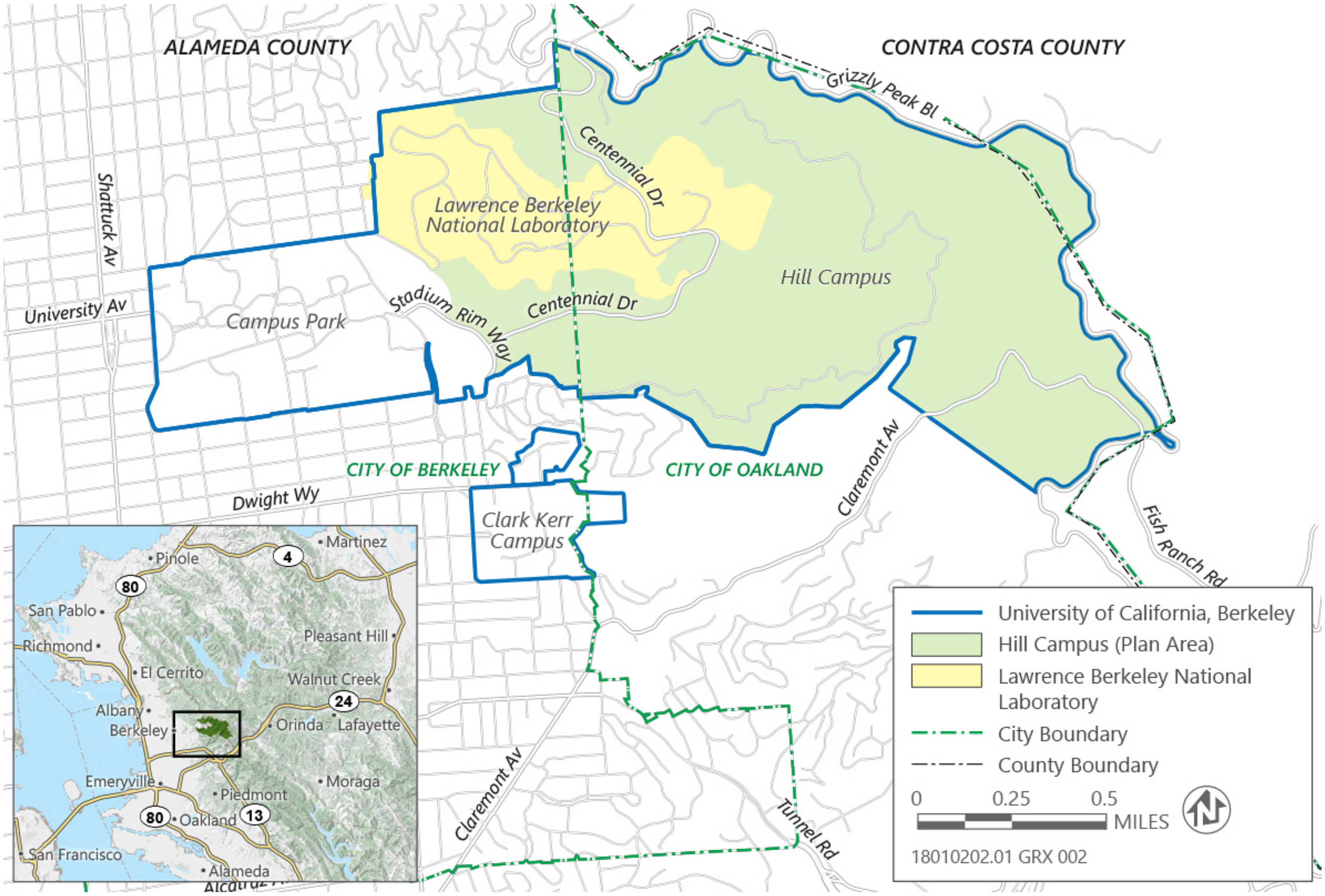
The Plan also identifies two fuel break projects, four temporary refuge areas, and three fire hazard reduction projects in designated locations (project areas) within the Plan Area. Fuel breaks (FB) are proposed on Claremont Ridge (East-West FB) and between the Hill Campus and the Hearst Gate to the Lawrence Berkeley National Laboratory (LBNL) (Hearst Gate FB). The temporary refuge areas (TRAs 1-4) are proposed adjacent to Claremont Avenue, in two areas along Jordan Fire Trail, and adjacent to Centennial Drive in the Lawrence Hall of Science parking area. The fire hazard reduction (FHR) projects include vegetation treatments in Strawberry Canyon (Strawberry FHR Project), Claremont Canyon (Claremont FHR Project), and on areas along Frowning Ridge (Frowning FHR Project). These nine specific projects are collectively referred to as the "Identified Treatment Projects" and are shown on Figure 2-2 below.

Implementation of the various treatment types and activities will be reviewed for use throughout the Plan Area at a programmatic level, and the nine Identified Treatment Projects will be studied at a project level of detail in this EIR. The near-term implementation of the Identified Treatment Projects along with the longer-term implementation of treatment activities studied at a program level, together comprise the proposed "project," as defined in State CEQA Guidelines Section 15378.

Under an existing program, known as the 2020 Hill Area Fire Fuel Management Program, UC Berkeley currently undertakes ongoing vegetation treatment maintenance actions that were approved under the 2020 Long Range Development Plan EIR (refer to Section 2.4 for additional information). The existing Hill Area Fire Fuel Management Program will be incorporated into the WVFMP to consolidate all of UC Berkeley's fuel management activities, but only the newly proposed treatment programs will be analyzed as the project in this EIR, with vegetation treatments that have been completed under the ongoing vegetation treatment maintenance program considered as part of the environmental baseline, as prescribed by CEQA (see, particularly, CEQA Guidelines Section 15125(a), which describes environmental setting and baseline considerations).

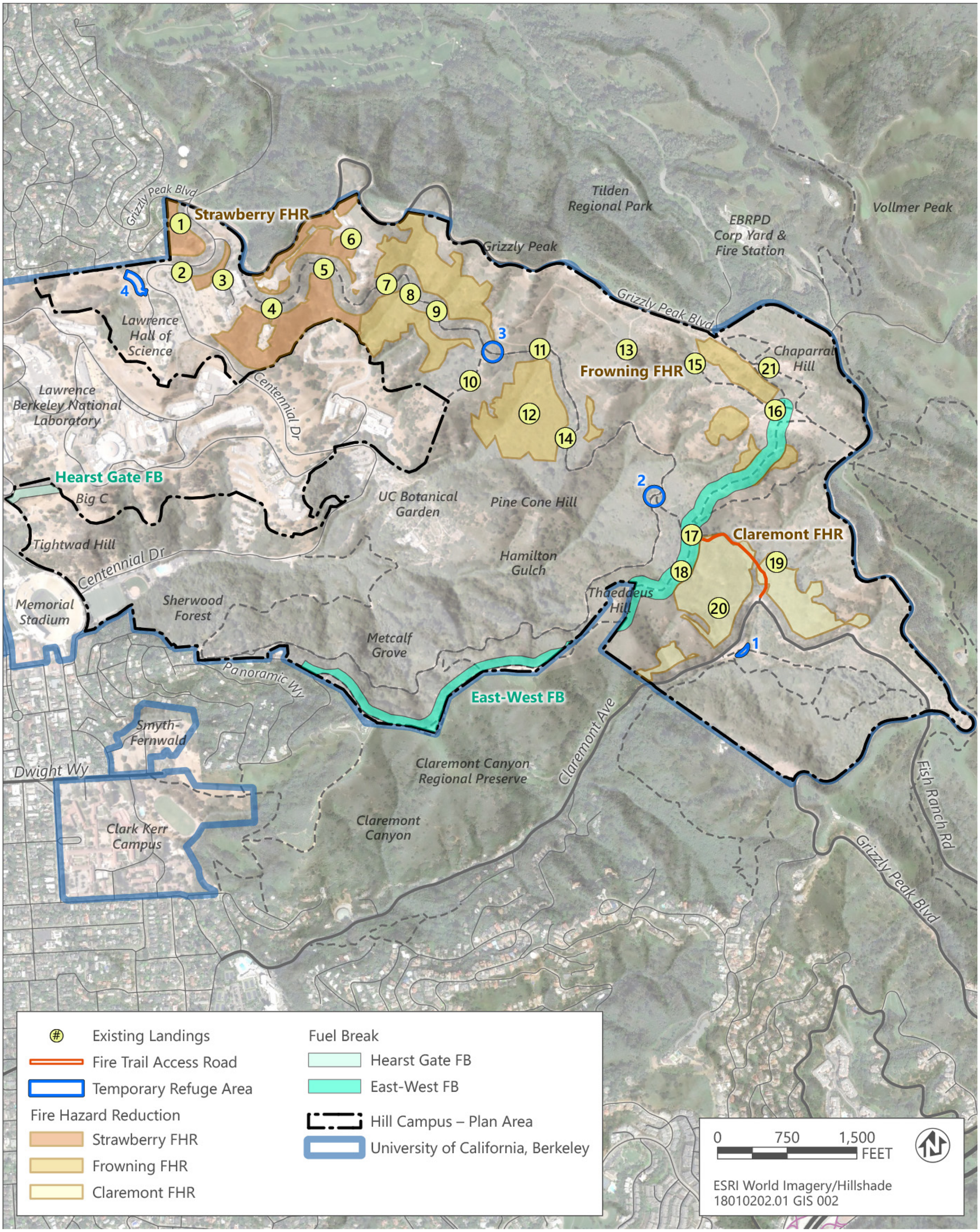
2.2 PLAN LOCATION

The Plan Area is the UC Berkeley Hill Campus, located in the East Bay of the San Francisco Bay Region in the hills adjoining and east of the UC Berkeley Campus Park and California Memorial Stadium. The Plan Area is primarily in Alameda County with a small area in unincorporated Contra Costa County. Approximately 85 percent of the Plan Area is located within the City of Oakland; the lower or westernmost portion of the Plan Area lies within the City of Berkeley. Both cities are in Alameda County. The Plan Area is bounded on the east by Grizzly Peak Boulevard; to the west by Stadium Rim Way and private residences; to the south by Grizzly Peak Boulevard and the East Bay Regional Park District's (EBRPD's) Claremont Canyon Regional Preserve; and to the north by LBNL and private residences. LBNL manages approximately 200 acres adjacent to the Hill Campus, which are not included in the Plan Area. The Identified Treatment Projects are located within the boundary of the Plan Area. Refer to Figure 2-1 and Figure 2-2 for a regional map of the Plan Area and a map of the Identified Treatment Projects, respectively.



Source: UC Berkeley and Ascent Environmental 2020

Figure 2-1 Plan Area



Source: UC Berkeley and Ascent Environmental 2020

Figure 2-2 Identified Treatment Projects

2.3 OBJECTIVES OF THE PLAN

California Environmental Quality Act (CEQA) Guidelines call for the identification of objectives sought by a proposed project (CEQA Guidelines Section 15124[b]). A statement of objectives conveys the reasons for considering approval of the proposed Plan, including its intended benefits, and also guides the development of a reasonable range of alternatives to evaluate in an EIR. The objectives are to:

1. Substantially reduce risk to life, property, and natural resources on the UC Berkeley campus and in the greater East Bay region by managing the amount and continuity of vegetation in the Hill Campus that increases wildland fire hazards.
2. Minimize greenhouse gas emissions consistent with California's Global Warming Solutions Act of 2006 (as furthered by Senate Bill 32) by reducing the occurrence and severity of future wildfire emissions, increasing carbon sequestration, and providing other means and methods to reduce greenhouse gas emissions.
3. Contribute to the statewide goal of increasing the pace and scale of vegetation treatment activities to reduce the worsening statewide wildfire risk pursuant to Executive Order B-52-18 by implementing a regional approach to fuel reduction and emergency access in the East Bay hills in partnership with other agencies, organizations and university neighbors.
4. Substantially reduce highly flammable invasive plant species and promote the growth of fire-resistant native plant species to reduce wildfire risks and enhance biodiversity.
5. Enhance evacuation routes and access for emergency fire suppression activities on the Hill Campus to improve emergency evacuation, emergency access, and wildfire containment.
6. Increase the efficiency of vegetation treatment considerably in the Hill Campus by providing a variety of vegetation treatment types and activities that may be selected in specific areas based on effectiveness in reducing wildfire risk, while also considering the presence of sensitive resources, topography, vegetation types, and resource management goals.
7. Implement an adaptive management framework to promote the long-term effectiveness of vegetation management activities to reduce wildfire risk.
8. Maximize the long-term effectiveness of initial vegetation treatments to responsibly use California Department of Forestry and Fire Protection California Climate Investments grant funds.

2.4 PAST AND CURRENT VEGETATION TREATMENTS

As described above, UC Berkeley maintains an approved and ongoing program of vegetation treatment and maintenance activities in the Plan Area to reduce fire risk to the UC Berkeley campus, LBNL, neighboring properties, recreational amenities, and to adjacent park and watershed lands. Past, ongoing, and planned vegetation treatments described in the existing 2020 Hill Area Fire Fuel Management Program include defensible space and roadside treatments; evacuation support treatments; roadside turnout and signpost treatments; exotic plant removal; hazard tree removal; and tree planting (i.e., replacing flammable vegetation with more fire-resistant vegetation). These ongoing activities have been addressed in the UC Berkeley *2020 Long Range Development Plan EIR* (State Clearinghouse No. 2003082131). These activities will be described in the Plan but have already been reviewed under CEQA and are therefore not part of the proposed project that will be studied in the EIR.

Ongoing defensible space treatments involve vegetation removal in areas within 100 feet of any structure, consistent with California PRC 4291. Roadside treatments are implemented along major roads and fire trails within and bounding the Plan Area. Roadside treatments involve vegetation removal and are conducted along the strip of land up to 15 feet from the edge of pavement from both sides of designated roadways and fire trails for brush vegetation and tree removal or pruning. Evacuation support treatments involve removing highly flammable trees, understory shrubs and small trees that could enable torching, and trees that may block access/egress should they fall; these treatments are implemented within 100 feet on either side of evacuation routes. Roadside turnout and signpost treatments involve cutting grass and removing debris within a 50-foot radius of designated turnouts and around selected signposts. For exotic plant removal, UC Berkeley pulls or cuts eucalyptus, Monterey pine, and French broom seedlings, and applies herbicides to the cut exotic plants according to recommendations of a Pesticide Control Advisor (PCA). Hazard tree removal involves removing dead and hazardous trees or limbs that pose a public safety risk. Tree planting is conducted under the supervision of Facilities Services Fire Mitigation Program Manager. Native trees, including oaks, maples, and buckeyes are selected by staff, with volunteer labor planting the trees in the late winter or spring. Most recently, this activity has occurred on Tightwad Hill, in openings created from the removal of hazard trees.

Typically, the vegetation treatment activities described above are carried out under contract by Facilities Services using hand crews and hand-held tools, with occasional use of machinery to cut grass and shrubs and to chip woody material. Herbicides are applied to roadside vegetation by hand-held tools; however, herbicide use is currently limited. Additional vegetation treatment activities are conducted by the Claremont Canyon Conservancy, UC Berkeley Forestry Club and a local non-profit, Take to The Hills, to assist in maintaining the Plan Area through removal of flammable exotic invasive species and planting less flammable species. The combined efforts of restoration work typically exceed 500 volunteer-days annually.

Using a portion of the funding received by CAL FIRE California Climate Investments (CCI) Fire Prevention Grant Program, Facilities Services anticipates that it will increase its implementation of defensible space and roadside treatments, evacuation support treatments, roadside turnout and signpost treatments, exotic plant removal, hazard tree removal, and selective tree planting throughout the Plan Area; these activities, which are included in the existing 2020 Hill Area Fire Fuel Management Program, are part of the ongoing treatment and maintenance activities approved in the UC Berkeley *2020 Long Range Development Plan EIR* (State Clearinghouse No. 2003082131).

2.5 PLAN DESCRIPTION

2.5.1 Description of Vegetation Treatment Types

Four vegetation treatment types are proposed to be implemented within the Plan Area to reduce wildfire risk and increase wildfire resiliency. These include evacuation support treatments, temporary refuge areas, fuel breaks, and fire hazard reduction treatments. These treatment types would be implemented at various locations in the Plan Area based on the conditions and objectives of treatment at a given site, local assets at risk, ecological conditions, and other factors. Implementation of vegetation treatments would typically occur on weekdays, between 8:00 a.m. and 6:00 p.m., and no work would occur on holidays.

EVACUATION SUPPORT TREATMENTS

Evacuation support treatments are roadside treatments that are proposed along emergency evacuation routes throughout the Hill Campus including these major emergency access routes within and bounding the Plan Area: Stadium Rim Way, Centennial Drive, Grizzly Peak Boulevard, Claremont Avenue, and Jordan Fire Trail. Roadside treatments involve vegetation removal, focusing on trees regardless of species, and are conducted along the strip of land up to 100 feet from the edge of pavement on both sides of designated roadways and fire trails. Vegetation treatment for evacuation support would focus on removing (including pruning) all trees prone to torching up to 100 feet from either side of major evacuation routes that could potentially block access if they fall. In certain specific situations hazardous trees taller than 100 feet with the potential to fall on a roadway that are located further than 100 feet from the roadway may be removed. The secondary focus of vegetation treatments would be to remove understory shrubs and small trees that could enable torching, and would also be implemented up to 100 feet on either side of identified emergency evacuation routes. The buffer for evacuation support treatments could increase to 200 feet in some instances (see below). Criteria for retention of trees includes consideration of whether its removal would facilitate the spread of invasive plant species and surface fuels, improve habitat within the understory, encourage nesting and improve flight patterns of raptors, and prevent erosion.

Treatment activities used to implement evacuation support treatments could include any of the proposed treatment activities identified in Table 2-1 below. Completion of evacuation support treatments would typically take up to 10 weeks over the course of two years (and would be periodically repeated in subsequent years) but could be longer depending on the size of the treatment area. The conditions of remaining trees would be monitored the year after initial treatment.

During active treatments, temporary closures of portions of roadways may be needed to allow cutting and skidding of trees close to the road. Typically, roads would be open before 9:00 am and after 3:00 pm on weekdays and no work would occur on weekends. In some cases, only one lane would need to be closed for a few hours at a time. Fire trails receiving treatments would also be closed to the public as necessary during treatments. UC Berkeley would coordinate with adjacent facilities and local jurisdictions and fire departments to plan emergency access or alternative access to the areas served by the roads and trails during closures.

Table 2-1 Proposed Treatment Activities

Treatment Activity	Description	Equipment[1]	Average Crew Size	Method of Application
Manual Treatment	Use of hand tools and hand-operated power tools to cut, clear or prune herbaceous or woody species	Shovels, Pulaski hoes, McLeod fire tools, machetes, pruning shears, weed whips, weed wrenches, hand saws, chainsaws, mechanized brush cutters, loppers	6-15	Hand pull and grub, thin, prune, hand pile, lop and scatter, hand plant; often combined with pile burning
Mechanical Treatment	Use of motorized equipment to cut, uproot, crush/compact, or chop existing vegetation	Feller buncher, yarder, skidder, masticator, tractor, brush cutters/mower, grapple saw	8-9	Mastication, cutting, chipping, brush raking, grading, tilling, mowing, roller chopping, skidding and removal, piling; can be combined with pile burning
Prescribed Broadcast Burning	Prescribed broadcast burning is used to reduce fuels over a larger area or restore fire resiliency in target fire-adapted plant communities; would be conducted under specific conditions related to fuels, weather, and other variables	1-2 fire trucks, water tender, drip torches, 1-2 hand crews	6-15	Install fire containment lines around the burn area, then ignite vegetation with a specific pattern of ignition with a control line along the perimeter
Managed Herbivory (livestock grazing)	Use of domestic livestock to reduce fire fuels or competition of desired plant species	Temporary or permanent fencing, water trough	1-2	Grazing or browsing by cows, goats, or sheep
Herbicide Application	Chemical application designed to prevent or inhibit growth of target plant species and include triclopyr, imazapyr and glyphosate-based herbicides. Pre-emergent herbicides, which kill germinating seedlings, may include Snapshot 2.5TG or Surflan AS	Backpack with hand applicator	1-2	Ground-level application only, such as paint-on stems or stumps and hand-spray applicator. No aerial spray is allowed.

Source: UC Berkeley 2019

[1] The following describes the specialized equipment that could be used for treatments:

- Pulaski hoes – a hand tool that combines an axe and adze in one head to chop wood and dig soil
- McLeod fire tools – a hand tool that combines a heavy crush rake with a wide hoe to rake fire lines and cut branches and sod, among other uses
- Feller buncher – motorized equipment used to gather and cut a tree before felling it
- Yarder – motorized equipment with a series of cables and pulleys to pull logs from the stump to the landing
- Skidder – any heavy-duty vehicle (e.g., tractor) used to move (or skid) cut trees from the stump to the landing
- Grapple saw - a large claw that can cut and remove trees and other vegetation that is mounted on a vehicle or other equipment

TEMPORARY REFUGE AREAS

Temporary refuge areas would be created in strategic locations throughout the Plan Area. These areas are intended to provide temporary refuge from wildfire for evacuees and firefighters and would be typically sited near the intersections of roads and fire trails. To create a temporary refuge area, all trees and shrubs would be removed in an approximately 200-foot diameter area from the edge of pavement or fire trail. Low profile and regularly mowed grass could remain within temporary refuge areas, although all other vegetation would be removed. These places of refuge would be sited in collaboration with local wildfire response agencies.

Treatment activities used to implement temporary refuge areas could include any of the proposed treatment activities identified in Table 2-1 below; however, treatment activities would primarily consist of manual and mechanical vegetation removal, followed by the use of herbicides.

Four specific temporary refuge areas are proposed and described in more detail in Section 2.4.4, “Identified Treatment Projects.”

FUEL BREAKS

Fuel breaks are strategically-located linear strips where vegetation has been treated or removed to aid in the containment of a fire and reduce the likelihood of crown fire transition. To implement fuel break treatments under the Plan, UC Berkeley would either remove understory vegetation and select trees (i.e., shaded fuel breaks) or remove all tree and shrub vegetation in the fuel break area, leaving only some herbaceous vegetation (i.e., non-shaded fuel break) to minimize fire intensity if ignited by a wildland fire. Figure 2-3 show an example of a shaded and non-shaded fuel break. Treatment would also alter the structure of the forest to inhibit torching and ember distribution. Fuel breaks serve the dual purpose of creating a non-burnable area to stop the spread of fire and as a defensive position to enable effective firefighting and fire-retardant application. Fuel break treatments in the Plan Area would be up to 200 feet wide and installed on ridgelines or other areas naturally low in vegetation to limit the spread of fire from trees between canyons. Treatment activities used to implement fuel break treatments could include any of the proposed treatment activities included in Table 2-1. Completion of fuel break treatments would typically take up to 8 weeks but would vary somewhat depending on the size of the fuel break.

Fuel breaks would be implemented in strategic locations throughout the Plan Area. Two specific fuel break treatment projects are proposed and described in more detail in Section 2.4.4, “Identified Treatment Projects.”

Source: CAL FIRE 2019

Source: Provided by UC Berkeley in 2020

Figure 2-3 Examples of Shaded and Non-Shaded Fuel Breaks

FIRE HAZARD REDUCTION TREATMENTS

Fire hazard reduction treatments would focus on reducing hazardous fire conditions in the Plan Area to help promote landscape resiliency and improve native habitat, and would be primarily implemented in areas where eucalyptus trees were previously removed but regrowth occurred because of ineffective follow-up treatments. UC Berkeley would evaluate trees and shrubs for vertical and horizontal spacing; remove tall, unhealthy, structurally unsound or highly flammable trees that are likely to torch and distribute embers; and remove short understory trees. Criteria for tree removal would include consideration of tree health, structure, height, potential for failure, flammability/fire hazard, high fuel volume production of small diameter fuels, and competition with other trees (including for water, space, and light). Criteria for retention of trees includes species type, consideration of ability to slow spreading of invasive species and surface fuels, protection of understory, encouragement of nesting and improvement of flight patterns of raptors, erosion prevention, and cost of removal. Near roads, trails, and buildings, lower limbs of trees would be pruned, understory vegetation shortened, and grass mowed.

Treatments could involve a variety of activities, including manually and mechanically removing high fire hazard vegetation and trees using hand tools, feller-bunchers, or a grapple saw. Wherever possible, trees would be removed with machinery that can be positioned on roads, skid trails, landings and fire trails that use articulated arms with attached saws or grapples (e.g., a feller buncher). Trees on steep slopes would be cut down using hand-held equipment only; no heavy equipment would be used. To prevent resprouting, an herbicide would be applied by a licensed applicator to specific tree stumps immediately following removal.

Downed trees would be skidded by rubber-tired or tracked vehicles along skid trails to landings. A crane located on a road may be used to reposition tree trunks after cutting. At landings, trees would be stored, incinerated, or chipped using a grapple-fed chipper or a tracked chipper. Chips would be spread onsite, transported to an air curtain or gasifier to supply electricity directly to the campus, or hauled to a UC property outside of the Plan Area. Refer to Section 2.7, "Biomass Utilization and Disposal," for more information about methods of biomass disposal. Completion of fire hazard reduction treatment projects would typically take up to 10 weeks over two years but could vary somewhat depending on the size of a planned fire hazard reduction project.

Fire hazard reduction treatments could be implemented in various locations throughout the Plan Area. Three specific fire hazard reduction projects are proposed and described in more detail in Section 2.4.4, "Identified Treatment Projects."

2.5.2 Description of Vegetation Treatment Activities

The vegetation treatment activities proposed to implement treatments in the Plan Area include manual treatment, mechanical treatment, prescribed broadcast burning, managed herbivory (livestock grazing), and targeted ground application of herbicides. Herbicide use involves only ground-level application, and UC Berkeley does not use aerial applications of herbicides.

Each of these vegetation treatment activities could be used to implement treatment types within the Plan Area, and are described in more detail below. Several landings and skid roads exist in the Plan Area from previous logging activities, and no new landings or access roads would be created under the Plan. Some minor grading may be required to remove vegetation and reestablish certain landings for use during treatment activities. The locations of landings that would be used throughout the Plan Area are shown in Figure 2-2.

The vegetation treatment types would be implemented using various combinations of the treatment activities. The treatment activity or activities selected would be those that are most likely to achieve the desired treatment objectives for the specific site, protect natural resource values, and meet the overall Plan objectives. During the planning phase for a vegetation treatment, the appropriate treatment activity or activities would be selected that best match the operational needs and treatment constraints on the landscape. Descriptions of the treatment activities proposed as part of the Plan are summarized in Table 2-1.

MANUAL VEGETATION TREATMENT

Manual vegetation treatment involves the use of hand tools and hand-operated power tools to cut, clear, or prune herbaceous and woody species (Figure 2-4). Activities could include thinning trees and shrubs; cutting undesired competing brush species; manually pulling, grubbing, or digging out root systems of undesired plants to prevent sprouting and regrowth; and placing mulch, such as wood chips from pruning operations, around desired vegetation to limit competitive growth and minimize erosion. This treatment allows for selective removal of targeted species. Historically, UC Berkeley has primarily used manual treatments to manage vegetation throughout the Plan Area.

Manual treatments are typically used in developed, sensitive or hard to access areas for small-scale projects. Consequently, ground disturbance associated with manual treatments is typically less than mechanical treatment within an equivalent area. Hand tools include, but are not limited to, shovels, Pulaski hoes, McLeod fire tools, weed whips and "weed wrenches" (tools that pull both shrub and root system out), chain saws, hand saws, mechanized brush cutters, machetes, pruning shears, and loppers. Hand cutting can involve workers using chain saws and wedges to fell a tree in a direction that facilitates processing. Masticators, which is a mechanical treatment method, and chippers are used occasionally to assist with manual treatments and process cut materials into mulch to remain onsite. Vegetation removed during manual treatments (i.e., biomass) would be left onsite or disposed of by skidding to landings to be chipped and spread onsite, placed as log barriers on campus, placed in an onsite gasifier to generate energy for the campus, incinerated in an air curtain or carbonator, hauled to a UC property outside of the Plan Area, or piled onsite to be burned. Refer to Section 2.4.3, "Biomass Disposal and Utilization," for more information on handling biomass under the Plan.

Manual treatment crews would typically consist of 6-15 personnel working up to 8 hours per day. As conditions allow, manual treatments would be conducted throughout the year.

MECHANICAL VEGETATION TREATMENT

Mechanical vegetation treatment involves the use of heavy motorized equipment, such as feller-bunchers and masticators, specially designed to cut, tear, uproot, crush, compact, or chop target vegetation (Figure 2-5). Mechanical treatment methods that may be used include mowing, masticating (mulching), grubbing, and chipping, among others. Mowing using a tractor reduces fuel height of vegetation and performed at the appropriate time can reduce the amount of manual work needed to maintain an area. Mechanical treatment is effective at removing dense stands of vegetation and is typically used in shrub- and tree-dominated vegetation communities. Mechanical treatments are appropriate where a high level of control over vegetation removal is needed, such as near residential areas or in sensitive habitats. Unless followed with targeted application of herbicides, mechanical treatment has limited use for noxious weed control, as the machinery tends to spread seeds and may not kill root systems.

Depending on the intended purpose, two or more pieces of heavy equipment could be used together. For example, a feller-buncher may be used for cutting material, while another piece of equipment moves the cut material to a landing or staging area where it can then be further treated or transported onsite. Feller-bunchers are used to quickly remove trees and may need to be supported by skidders to move trees and materials. Feller-bunchers are tracked vehicles with a self-leveling cab that mechanically grasps the standing tree, cuts it with a hydraulically powered chain saw, and arranges cut trees in bunches to facilitate dragging the tree out of the forest (skidding). Use of feller-bunchers is limited to slopes of less than approximately 45 percent. A grapple saw is a large claw that can cut and remove trees and other vegetation that is mounted on a vehicle or other equipment, such as a truck, tractor, or excavator. A grapple saw can fell and remove trees up to 100 feet from where it is mounted and would be used from existing roadways to remove vegetation from sensitive interior areas.

Source: Provided by UC Berkeley in 2020

Source: Provided by UC Berkeley in 2020

Figure 2-4 Examples of Manual Vegetation Treatment

Source: Provided by UC Berkeley in 2020

Source: Provided by UC Berkeley in 2020

Figure 2-5 Examples of Mechanical Vegetation Treatment

Source: Provided by UC Berkeley in 2020

Figure 2-5 (continued) Examples of Mechanical Vegetation Treatment

Landings are typically needed to sort, store, and chip cut trees into mulch and spread or remove the material. A flat landing area is typically used for yarding operations, temporary stacking, loading, and trucking logs or brush off the treated site. As previously described, several landings and skid roads exist in the Plan Area from previous logging activities, and no new landings or access roads would be created, although minor grading and clearing would be required to reestablish some of the landings.

Mechanical treatment crews would typically consist of 8-9 personnel working up to 8 hours per day. As conditions allow, mechanical treatments would be conducted throughout the year.

PRESCRIBED BURNING

Prescribed burning is the intentional application of fire in a pre-defined, specific location under prescriptive conditions of fuels, weather, and other variables. Prescribed burning refers to broadcast burning of vegetation and pile burning. Pile burning would be used as a method to dispose of biomass and is discussed in detail in Section 2.5.5, "Biomass Disposal and Utilization," below.

Prescribed broadcast burning produces low-intensity surface fires that are intended to control vegetation by enhancing the growth, reproduction, or vigor of certain species, in addition to reducing fuel loads and/or maintaining a targeted vegetation community. The fire burns along the surface without significant movement into overstory vegetation, with short flame lengths. Refer to Figure 2-6 for examples of previous prescribed burns that have been conducted at UC Berkeley.

Typically, prescribed broadcast burning uses existing roads and trails as fire containment lines, otherwise fire containment lines are constructed using manual or mechanical treatments. In some cases, vegetation may be trimmed, thinned, or removed manually by prescribed herbivory, hand crews or by mechanical equipment in advance of burning, or vegetation may be pretreated with herbicides to kill the aboveground portions and cause them to dry before burning.

Prescribed broadcast burning may be used where other activities are not feasible because of rocky soils, steep slopes, or irregular terrain. This activity is used only during conditions under which the risk of losing control of the burn is extremely low and when air quality conditions permit. Fire suppression equipment (e.g., fire engine(s) and a water tender) would be onsite during a prescribed broadcast burn to quickly extinguish any fire that deviated from the burn prescription.

Source: Provided by UC Berkeley in 2020

Source: Provided by UC Berkeley in 2020

Figure 2-6 Examples of Pile Burning and Broadcast Burning

Factors that are considered when designing and implementing a prescribed broadcast burn include risk to structures and property, land use, weather conditions, soil stability, slope and aspect, soil type, vegetation types and density, fuel moisture content, time of year, fire return interval (i.e., the time between fires in a defined area), and the efficacy of alternative treatment methods. Burning may occur throughout the year, but it is usually conducted during late spring when the ground is still moist before some plants have set seeds, or during the fall or winter when precipitation is imminent, and plants have completed their yearly growth cycle and their moisture content has declined.

In the past, UC Berkeley has implemented prescribed broadcast burns in the Plan Area in late winter when leaf litter is dry but annual grasses are moist and green. Prescribed broadcast burns would typically last one day, but could last up to one week. Equipment used for a prescribed broadcast burn would include 1-2 fire engines, an onsite water tender for fire suppression, and ignition devices such as drip torches. No chemical fire suppressants would be used under the WVFMP. Crews implementing prescribed broadcast burns would typically consist of 6-15 personnel working up to 8 hours per day, with up to two crews onsite simultaneously. Manual and mechanical treatment activities and associated equipment described above could also be used to prepare an area for a prescribed broadcast burn.

Prescribed burns in the Plan Area would require the preparation of a burn plan that includes a smoke management plan (SMP) approved by the Bay Area Air Quality Management District (BAAQMD). BAAQMD Regulation 5 requires all burn activity to only occur with written approval of a SMP by BAAQMD and only be conducted on permissive burn days. Given the challenges involved in executing a broadcast burn, broadcast burning under the WVFMP would typically be relatively small scale and infrequent.

MANAGED HERBIVORY (TARGETED GRAZING)

Managed herbivory, also known as "targeted grazing," is the use of domestic livestock (e.g., goats, sheep, cattle) to accomplish specific and measurable vegetation management objectives (refer to Figure 2-7). Objectives include removing biomass (fine fuel loads), reducing populations of specific plant species, slowing the reestablishment of shrubs on burned or mechanically thinned sites, and improving plant community structure for wildlife habitat values. Grazing/browsing is best used for green herbaceous plants that produce fine fuels and smaller diameter woody species that produce highly flammable fire fuels. Since the 1980's, UC Berkeley has used goats to manage grasslands and shrublands in the Plan Area including below the Lawrence Hall of Science, Math Science Research Institute (MSRI), and the Field Station for the Study of Behavior, Ecology, and Reproduction (FSSBER).

Source: U.S. Air Force Photo by Heide Couch in 2018

Figure 2-7 Example of Managed Herbivory

Livestock are selected according to site conditions and the types of vegetation that need to be managed. Goats are typically best suited to woody vegetation and in steep terrain; sheep eat both forbs and grasses and can be used in a variety of environments; and cattle are better suited to herbaceous plants, especially grasses.

Managed herbivory by domestic livestock could occur throughout the year. Up to 50 goats would be transported to the Plan Area from the FSSBER up to 4 times each year using a trailer. Livestock would be deployed in consideration of when the target plant species are palatable and when feeding on the plants can damage them or reduce viable seeds. Additionally, managed herbivory would be restricted during critical growth stages of desirable plant species. The size of grazing areas and frequency of moving livestock is based on numerous site-specific factors, including slope, density and type of vegetation, stocking rate, type of livestock, and precipitation/moisture content of vegetation, although in the Plan Area livestock would typically only graze a given area for one day.

Targeted grazing by sheep and goats requires staff and infrastructure, such as a herder, shepherd dog, solar electrified fencing, mineral block, and supplemental food and/or a watering site to keep the animals within the desired area. The herd would be secured in a holding pen at night. Targeted grazing by cattle requires periodic movement and stable fencing; however, no herding is required. Active grazing would typically occur Monday through Friday, and would not occur over weekends. Grazed areas would be examined daily to make sure the grasses are eaten low but high enough to prevent erosion and to prevent trail blazing by the goats (e.g., crating ruts in the soil). Up to 100 acres of the Plan Area would be treated annually through managed herbivory. No grazing of areas treated with herbicides would occur within one week of herbicide application (see EPM HAZ-11).

HERBICIDE APPLICATION

Herbicides are chemicals that damage or kill plants and are categorized as selective or non-selective. Selective herbicides kill only a specific type of plant, such as broad-leaved plants, which allows the herbicide to be used to control weeds while maintaining grass species. Non-selective herbicides kill any type of plant and must be used carefully to avoid damaging non-target plants. Herbicides are also classified as pre-emergent, which kill germinating seedlings. Herbicides that may be applied under the proposed Plan are included in Table 2-2.

Table 2-2 Herbicides Included in the WVFMP

Product Name	Active Ingredient(s)	Type
Garlon 4 Ultra	Triclopyr	Selective
Roundup Pro	Glyphosate	Non-selective
Snapshot 2.5 TG	Isoxaben and Trifluralin	Selective
Stalker	Imazapyr	Non-selective
Surflan AS	Oryzalin	Selective
Transline	Clopyralid	Selective

Source: UC Berkeley 2019 and Appendix G

Source: Provided by UC Berkeley in 2020

Source: Provided by UC Berkeley in 2020

Figure 2-8 Examples of Herbicide Application

As shown in Table 2-2, two of the six herbicides that may be used under the Plan are non-selective. Only ground-level herbicide application by hand would occur under the Plan; UC Berkeley does not use aerial applications (refer to Figure 2-8). UC Berkeley would use the following techniques under the oversight of a licensed Pesticide Control Advisor (PCA) to apply herbicides:

- *Cut Stump Application*: To maximize the efficacy of treatment, the tree must be cut leaving a stump not more than 4 inches in height above soil surface and the cut surface of the stump must be treated with an herbicide within minutes of the cut. The herbicide is carefully applied to the surface of the stump by hand and is translocated to the roots and disrupts the transportation of nutrients and water, causing the tree to die.
- *Basal Bark Application*: This treatment consists of very targeted, low pressure spraying of 1 to 2 ounces of diluted triclopyr and imazapyr in a solution of methylated seed oil, water, and marking dye to the lower 12 to 15 inches of a resprout. This application method permits the operator to selectively treat resprouts without injury to adjacent vegetation, and is particularly effective on resprouts less than six inches in diameter.
- *Foliar Spray Application*: In foliar spraying, the herbicide is diluted with water at a specific rate, and sprayed over target foliage until every leaf is wetted, but not dripping. This method is most suited to shrubs, grasses, and dense vines and would be used for invasive plant control. Foliar spray applications would only be conducted from the ground using handheld application devices.

Safety concerns associated with the use of herbicides are addressed by adhering to requirements for application methodology, regulatory requirements (e.g., requirement to have a licensed PCA involved in the project), label restrictions for each individual herbicide, and project-specific guidelines. The risks intended to be addressed by these requirements include the potential to damage or kill non-target plants; development of a resistance to a particular herbicide over time; and toxicity to humans, animals, birds, amphibians, reptiles, insects, and fish.

Effective June 1, 2019, UC President Janet Napolitano issued a temporary suspension, with several exceptions, on the use of glyphosate-based herbicides at all UC locations. Exceptions for use of glyphosate-based herbicides include, among others, fuel-load management programs to reduce wildfire risk. As of early 2020, the President accepted recommendations made by the UC Task Force related to the use of pesticides, including specific requirements for herbicides that are classified as Tier 1/high hazard. Glyphosate and Garlon have been designated Tier 1 and therefore, cannot be used without prior approval by the UC's Integrated Pest Management Committee (IPMC). If use is permitted by the IPMC, regulations for the approved uses of Glyphosate and Garlon on the UC Berkeley campus would be more stringent than what is currently required by state law.

Herbicide application under the WVFMP would comply with UC requirements, all U.S. Environmental Protection Agency (EPA) label directions, as well as California Environmental Protection Agency and Department of Pesticide Regulation (DPR) label standards. Herbicide applicators would wear personal protective equipment (PPE; these are different than used by medical workers) during applications and either possess a valid license or certificate from the California DPR or receive appropriate training and/or direct supervision by a PCA.

2.5.3 Treatment Maintenance and Monitoring

Maintenance and monitoring of treated areas would be implemented to retain the benefits of initial vegetation treatments. UC Berkeley would implement a monitoring program to guide future maintenance activities, which would involve defining performance standards, establishing reporting standards, evaluating treatment area characteristics, and identifying appropriate maintenance activities or remedial measures if performance standards are not being met.

Post-treatment monitoring would be conducted immediately following vegetation treatments and on an annual basis, to inform ongoing maintenance strategies. Permanent photographic points would be established within each treatment area to track regrowth following initial treatments. Monitoring would consist of evaluating native and exotic vegetation composition, canopy cover, woody plant resprouting, wood chip placement and depth, and erosion and soil stability. Refer to Appendix A for more information on the specific performance standards and criteria for each of the monitored characteristics.

A monitoring report consisting of photo points describing the status of each treatment area would be prepared annually for the first 5 years following the initial treatment, then every other year (years 7 and 9), and would conclude with a final, year 10 monitoring report, although follow-up treatments would continue to occur. It is anticipated that the WVFMP would be updated by year 10, which could alter post-treatment maintenance and monitoring methods and intervals. Annual reports for each treated area would be submitted to Facilities Services and the Physical and Environmental Planning departments by March 31 each year following implementation. The annual report would detail the monitoring activities and findings of the previous year. Through this process, UC Berkeley would evaluate the effectiveness of maintenance activities and incorporate adaptive management through use of new or different maintenance approaches, as needed, to achieve established performance standards for each treatment area and the objectives of the WVFMP.

Maintenance treatments could be different than the original treatment, such as a manual treatment using chainsaws to create shaded fuel breaks along roads followed by periodic managed herbivory or prescribed broadcast burning to keep sprouting and fuel loads low. Any of the vegetation treatment activities described in Table 2-1 could be used, but would primarily consist of herbicide use, and manual and mechanical treatments. UC Berkeley anticipates that fuel breaks would need to be maintained every 3 to 7 years depending on shrub growth; evacuation support treatments are expected to be maintained the following year, and then every 5-7 years thereafter; fire hazard reduction treatments are expected to be maintained every 5 years, based on fuel volume and potential ember production and distribution. However, treatment areas could be maintained at different intervals depending on specific characteristics such as the vegetation type and objectives of the treatment.

2.5.4 Access and Roads

Paved public access roads within the Plan Area include Centennial Drive, Stadium Rim Way and Claremont Avenue. Grizzly Peak Boulevard is the Plan Area's eastern boundary. These would be the primary access routes used by vegetation treatment personnel and are shown on Figure 2-1. Centennial Drive, aligned east-west, serves as the primary emergency access to and a major evacuation route from the Plan Area to the west. It also serves private residences and research institutes. Existing unimproved dirt fire trails would also provide access to treatment areas as well as for emergency vehicle and maintenance access. These fire trails include the East-West Trail and Upper and Lower Jordan Fire trails, which are heavily used for recreation and dog walking. Upper Jordan Fire Trail serves as the primary alternative emergency evacuation route for the Panoramic Hill neighborhood to the south.

The Plan Area also contains trails that are generally too steep or have turns too tight to accommodate full-sized trucks, but can support 4 wheel drive (4WD) pickups. Examples include Power Pole Trail, Down Trail, Claremont Trail, East Connector, and the newly built trail from Upper Jordan Fire Trail to Grizzly Peak (i.e., "Botanical Experience Trail"). The road network has been inspected and appears stable and sufficient to access the proposed treatment areas. UC Berkeley would inspect roads and trails before, during, and after operations. Refer to the WVFMP in Appendix A for more information and a map of about access and roads within the Plan Area.

Vegetation treatment related truck traffic would be limited to weekdays, between 8:00 a.m. and 6:00 p.m., and no work would occur on holidays. Some internal roads and fire trails would need to be closed to public access during treatments. The Upper Jordan Fire Trail is heavily used by the public and is the main internal road accessing many areas proposed for treatment. Public notifications would be made at least one week in advance of necessary closures and posted at all trailheads with an information contact.

2.5.5 Biomass Disposal and Utilization

Implementation of the Plan includes the removal of trees and other vegetation; once removed, this vegetative material is referred to as biomass. Under the WVFMP, biomass would be treated using the following methods and in the following approximate proportions for any treatment project. Biomass disposal methods would be determined based on the characteristics of the treated vegetation, the capacity of disposal sites, and the need for the treated product (e.g., chips or logs).

- Incinerated using an air curtain at Richmond Field Station – 60 percent
- Chipped or masticated and spread onsite – 20 percent
- Chipped or masticated and hauled to other UC Berkeley properties – 10 percent
- Burned onsite in piles – 5 percent
- Left onsite as logs – 5 percent
- Processed using a gasifier – negligible, used rarely

The majority of biomass (up to 60 percent) is expected to be incinerated using an air curtain burner, which traps and reburns smoke particles to reduce the particulate matter in comparison to open pile burning. The air curtain would likely be located at UC Berkeley's Richmond Field Station; all biomass to be incinerated by the air curtain would be hauled to this location, roughly 7 miles from the Plan Area. Any residual biochar (a charcoal-like substance that can be used to fertilize the soil) would be transported to the UC Berkeley Botanical Garden or the Gill Tract Community Farm in Albany to be used as a soil amendment.

Pile burning is the intentional application of fire to piles of cut vegetation. Burn piles may include brush and other vegetation that has been treated (e.g., cut or limbed) and other forest litter. Pile burning may be used, as warranted by site-specific conditions, as a method of biomass disposal in the Plan Area. A pile burn typically takes up to one day to complete. A photograph of pile burning is presented in Figure 2-6.

A small portion of logs would be anchored and utilized onsite for erosion mitigation, wildlife habitat, or as a physical barrier to access by the public. Some minor earthmoving may be required to secure logs in place near slopes. Chipped biomass would primarily be spread directly back onto the treated areas to reduce erosion potential. Chips spread on the hillside within 100 feet of roads and fire trails would have a maximum depth of six inches to prevent erosion and suppress invasive weeds. Some chips would be stockpiled in landings. In unusual circumstances, chip depth would be up to 24 inches in remote locations. Chips have been observed to decompose about five inches per year, based on previous treatments in the Hill Campus (refer to Appendix A). The volume of cut vegetation and biomass left onsite would be kept low enough to prevent excessive fuel buildup, interfere with access for monitoring, and encourage establishment of desirable vegetation after treatment. In addition, a portion of chips (approximately 10 percent) would be hauled to UC properties outside of the Plan Area to be composted or used in landscaping, including the Campus Park, Clark Kerr Campus, the Smyth-Fernwald Property, the Richmond Field Station, and Russell Research Station.

In the future, UC Berkeley could purchase a gasifier, which would burn biomass in an enclosed system to produce syngas, which would substitute for the use of fossil fuels, and produce biochar. Using a gasifier and wood-burning hydronic boiler would reduce the generation of greenhouse gases relative to leaving material to decompose, and by replacing a portion of the use of fossil fuels for electricity generation. The electricity generated would be used directly by the university.

2.5.6 Identified Treatment Projects

The proposed Identified Treatment Projects comprise strategically placed fuel breaks, temporary refuge areas, and fire hazard reduction projects in the Plan Area, totaling approximately 123 acres of treatments (see Figure 2-2) in the Hill Campus. Table 2-3 summarizes each of the Identified Treatment Projects, including the specific project names, treatment type, treatment activities, location in the Plan Area, and treatment acreage.

Table 2-3 Overview of Identified Treatment Projects

Project Name	Treatment Type	Treatment Activities	Location	Acreage of Impacts
East-West FB	Fuel Break	Manual, mechanical, herbicide use	Claremont Ridge between UC Berkeley property and Claremont Canyon Regional Preserve	22.0
Hearst Gate FB	Fuel Break	Manual, herbicide use	Between the Hill Campus and the Hearst Gate to LBNL	1.2
TRA 1	Temporary Refuge Area	Manual, mechanical, herbicide use	On the southeast side of Claremont Avenue at Signpost 29	0.1
TRA 2	Temporary Refuge Area	Manual, mechanical, herbicide use	Along the Upper Jordan Fire Trail at Signpost 32	0.72
TRA 3	Temporary Refuge Area	Manual, mechanical, herbicide use	South of and adjacent to the Upper Jordan Fire Trail	0.72
TRA 4	Temporary Refuge Area	None	Entirely within the existing paved Lawrence Hall of Science parking lot	0
Strawberry FHR Project	Fire Hazard Reduction	Mechanical, herbicide use	Areas in Strawberry Canyon near upper Centennial Drive and upper Jordan Fire Trail	23.7
Claremont FHR Project	Fire Hazard Reduction	Mechanical, herbicide use	Areas in Claremont Canyon north of Claremont Avenue	25.5
Frowning FHR Project	Fire Hazard Reduction	Manual, mechanical, herbicide use	Areas along Frowning Ridge near the upper Jordan Fire Trail	49.2
			Total	**123.1**

Notes: EST = evacuation support treatment, FB = fuel break, FHR = fuel hazard reduction, TRA = temporary refuge area. Numbers are rounded to the nearest tenth.
Source: Adapted by Ascent Environmental 2020.

The Identified Treatment Projects could be implemented any time of the year but would be timed to minimize environmental effects (e.g., erosion, disturbance of special-status species), and up to three treatments could occur simultaneously (i.e., three crews could work simultaneously in noncontiguous treatment areas).

Biomass disposal and utilization methods would be the same as identified above in Section 2.5.5, although no pile burning would occur. Based on a recently implemented vegetation treatment project in the Hill Campus with similar vegetation density as the Identified Treatment Project areas, it is estimated that up to 600 haul truck trips could be required to transport biomass from the Hill Campus to the Richmond Field Station and other locations over the course of implementation of the Identified Treatment Projects. As described below for each of the Identified Treatment Projects, implementation is expected to occur over two years (2021 and 2022); however, implementation may be accelerated if required by the CCI Grant Program in coordination with CAL FIRE. Conservatively assuming these 600 haul truck trips would occur over a total of 8 months (although the implementation period will likely be greater), up to 3 haul trips per day would be necessary to dispose of the biomass created.

Vegetation on steep slopes or within 50 feet of a water course would be cut down using hand equipment only, and no ground disturbing activities (e.g., skidding) would occur within one week following an inch or more of rain. Additional environmental protection measures (EPMs) would be incorporated into the design of treatments, which are described in Section 2.6 below. Follow-up maintenance and monitoring activities that would occur for the Identified Treatment Projects are described in Section 2.5.3, "Treatment Maintenance and Monitoring," above.

FUEL BREAK TREATMENT PROJECTS

As shown in Table 2-3, there are two fuel break treatment projects proposed, the East-West FB and the Hearst Gate FB; together they would be implemented on approximately 23 acres within the Plan Area. Up to 15 personnel would be required to implement each of the fuel break treatment projects, working up to 8 hours per day. They would be implemented over 2021 and 2022, as conditions allow.

East-West Fuel Break

The East-West FB is proposed on Claremont Ridge between UC Berkeley property and Claremont Canyon Regional Preserve. It would be up to approximately 7,314 feet (1.4 miles) in length and 126 feet wide, covering a total of approximately 22 acres of the Plan Area. It is expected to take up to 8 weeks to complete the project, using both manual and mechanical treatment methods. The East-West FB would be primarily a non-shaded fuel break (Figure 2-3), although some trees would remain. Any of the manual and mechanical equipment types listed in Table 2-1 could be used. Cut-stump application of herbicides would occur after manual and mechanical treatments to prevent resprouting. Equipment staging would occur within three existing landings in the vicinity of the East-West FB shown on Figure 2-2; some minor regrading may be required to clear the landings of vegetation; however, they are completely within the footprint of the proposed East-West FB. In addition, minor regrading totaling approximately 0.3 acres of the existing 10- to 12-foot wide fire trail extending from signpost 27 to the East-West FB would be required to enable 4WD vehicle passage (shown on Figure 2-2). No import or export of soil would be required.

Hearst Gate Fuel Break

The Hearst Gate FB is proposed between the Hill Campus and the Hearst Gate to LBNL. It would be up to approximately 559 feet (0.1 mile) in length and 93 feet wide, covering a little over 1 acre of the Plan Area, and would be implemented entirely using manual methods. The Hearst Gate FB is expected to take up to 4 weeks to complete. The Hearst Gate FB would be a shaded fuel break (Figure 2-3); understory vegetation would be removed and many trees would remain, as appropriate, to achieve the objectives of the treatment. Cut-stump application of herbicides would occur after manual treatments to prevent resprouting. Equipment staging would occur within the Foothill Housing parking lot outside of the Plan Area. No grading to reestablish landings would be necessary and no import or export of soil would occur.

TEMPORARY REFUGE AREAS

Four temporary refuge areas have been identified in the Plan Area to support evacuation as shown in Figure 2-2. One would be located adjacent to Claremont Avenue, two would be located along the upper Jordan Fire Trail, and one would be located adjacent to Centennial Drive in the existing Lawrence Hall of Science parking lot. The temporary refuge area proposed in the Lawrence Hall of Science parking lot (TRA 4) would be entirely within the footprint of the existing paved parking area; no ground disturbance or vegetation removal would be required. TRA 1 through TRA 3 together would be implemented over approximately 1.54 acres of the Plan Area.

To establish the three new temporary refuge areas, all trees and shrubs would be removed in a circular area from the edge of pavement or fire trail to create a temporary refuge for firefighters and evacuees. Mowed, low-profile grass may remain within the temporary refuge areas. Vegetation removal would be accomplished using manual and mechanical methods, followed by hand spraying of herbicides. Up to 8 personnel would be required to implement each of the temporary refuge area projects, working up to 8 hours per day, and each project would take up to 4 weeks to complete. These projects are anticipated to be implemented in 2021, as conditions allow. General information regarding temporary refuge areas is provided in Section 2.5.1, "Description of Vegetation Treatment Types," above.

FIRE HAZARD REDUCTION PROJECTS

As shown in Table 2-2, there are three fire hazard reduction projects proposed: the Strawberry FHR Project, the Claremont FHR Project, and the Frowning FHR Project. Together, they would be implemented on approximately 98.5 acres within the Plan Area. Treatment activities used to implement these projects would include varying combinations of manual and mechanical treatments to remove vegetation, followed by the use of herbicides using cut stump or basal bark application methods. Up to 15 personnel would be required to implement each of the fire hazard reduction projects, working up to 8 hours per day, and each project would take up to 10 weeks spread over two years to complete. These projects are anticipated to be implemented in 2021 and 2022, as conditions allow. General information regarding fire hazard reduction treatments is provided in Section 2.5.1, "Description of Vegetation Treatment Types," above.

Initial work contracts may be issued for several noncontiguous areas, for example, several 5-acre work areas could be treated simultaneously. Subsequent work areas would be contiguous to those already completed, each with a clear path to existing landing areas. Specific elements of each fire hazard reduction project are described below.

Strawberry FHR Project

Strawberry FHR Project would be implemented using mechanical equipment on approximately 24 acres in the northwesternmost part of the Plan Area. Six existing landings are located adjacent to fire trails or paved roads in Strawberry Canyon and project-related equipment would be staged, fueled, and maintained at these landings during project implementation (Figure 2-2). The Strawberry FHR Project would require the use of three existing unpaved access roads. The roads are approximately 12 feet wide and follow existing logging roads created during vegetation treatment work conducted in 1974 and 1975 and in 1989 and 1990 when trees were last cut in this area. Some minor grading may be required to reestablish four of the existing landings, although two of the four are entirely within the footprint of the proposed Strawberry FHR Project. No import or export of soil would occur. Herbicides would be applied by hand on eucalyptus and acacia tree stumps post removal to prevent resprouting.

Portions of the Upper Jordan Fire Trail could be temporarily closed to the public, as necessary, during treatments.

Claremont FHR Project

The Claremont FHR Project would be implemented using mechanical equipment on approximately 26 acres in the southeastern portion of the Plan Area. Four existing landings that are adjacent to existing fire trails or paved roads in the Claremont Canyon would be used for equipment staging, fueling, and maintenance during project implementation (Figure 2-2). Some minor grading may be required to reestablish the four existing landings for use; however, two are located entirely within the footprint of the East-West FB and two are entirely within the footprint of the Claremont FHR Project. No import or export of soil would occur. In addition, the fire trail requiring minor regrading described under "East-West Fuel Break" above would be used to enable access to haul logs. Herbicides would be applied by hand on eucalyptus and acacia tree trunks post removal.

Temporary closure of Claremont Avenue may be required for a few hours at a time to allow equipment to move on and off the treatment site. UC Berkeley would coordinate with the City of Oakland on closures of Claremont Avenue, to plan emergency access or alternative access to the areas served by the road.

Frowning FHR Project

The Frowning FHR Project would be implemented on approximately 49 acres spanning the northern portion of the Plan Area using manual and mechanical methods. Ten landings exist adjacent to fire trails or paved roads in the vicinity of the Frowning FHR Project (Figure 2-2). Equipment would be staged, fueled, and maintained at these landings. Some minor regrading may be required to reestablish five of the existing landings for use, one of which is entirely within the footprint of the Frowning FHR Project. No import or export of soil would occur. Herbicides would be applied by hand on eucalyptus tree stumps post removal.

Temporary closures of Grizzly Peak Boulevard and the Upper Jordan Fire Trail may be required to allow equipment to move on and off the treatment site. UC Berkeley would coordinate with appropriate public agencies concerning closure of Grizzly Peak Boulevard, as well as with adjacent facilities and local fire departments to plan emergency access or alternative access to the areas served by the fire trail.

2.6 ENVIRONMENTAL PROTECTION MEASURES

The environmental protection measures (EPMs) listed below would be incorporated into the design of vegetation treatments in the Plan Area. The EPMs are intended to avoid and minimize environmental impacts and comply with applicable laws and regulations. The EPMs would be incorporated into the mitigation monitoring and reporting program for the WVFMP and would be implemented and enforced in the same way as mitigation measures consistent with Section 15126.4 of the State CEQA Guidelines. For the purposes of these measures, references to "UC Berkeley" also encompasses any contractors hired to implement the treatments.

2.6.1 Administrative Environmental Protection Measures

- EPM AD-1 Maintain Site Cleanliness: If trash receptacles are used at treatment sites, UC Berkeley will use fully covered trash receptacles with secure lids (wildlife proof) to contain all food, food scraps, food wrappers, beverages, and other worker generated miscellaneous trash. UC Berkeley will remove all temporary non-biodegradable flagging, trash, debris, and barriers from treatment sites upon completion of project activities.
- EPM AD-2 Public Notifications of Road and Recreation Area Closures: At least one week before disruption or closure of a public roadway or fire trail, UC Berkeley will update its Facilities Services website with project information and install digital signage at multiple strategic locations notifying the public of project schedules, road and recreation area closures, and alternative routing.
- EPM AD-3 Public Notifications for Prescribed Burning: One to three days before the commencement of prescribed burning operations, UC Berkeley will post signs along the closest public roadway to the treatment area that describe the activity and timing, and identify a designated representative from UC Berkeley (contact information will be provided with the notice) to contact with any questions or smoke concerns.

2.6.2 Aesthetic and Visual Resource Environmental Protection Measures

- EPM AES-1 Avoid Staging within Viewsheds: UC Berkeley will store all treatment-related materials, including vehicles, vegetation treatment debris, and equipment, outside of the viewshed of public trails and roadways to the extent feasible. UC Berkeley will also locate materials staging and storage areas where they will minimize or avoid visual impacts.

2.6.3 Air Quality Environmental Protection Measures

- EPM AQ-1 Burn Plan and Smoke Management Plan: UC Berkeley will prepare a burn plan and submit a smoke management plan (SMP) to the Bay Area Air Quality Management District (BAAQMD) for all prescribed burns. Burning will only be conducted in compliance with the burn authorization program and SMP approved by the BAAQMD.
- EPM AQ-2 Minimize Air Emissions: UC Berkeley will implement applicable BAAQMD measures (BAAQMD 2017) to minimize air quality emissions, as appropriate, including the following:
  - All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) will be watered two times per day.
  - All haul trucks transporting soil, sand, or other loose material off-site will be covered.
  - All visible mud or dirt track-out onto adjacent public roads will be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
  - All vehicle speeds on unpaved roads will be limited to 15 mph.

- Idling times will be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage will be provided for construction workers at all access points.
- All construction equipment will be maintained and properly tuned in accordance with manufacturer's specifications. All equipment will be checked by a certified visible emissions evaluator.
- Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person will respond and take corrective action within 48 hours. The Air District's phone number will also be visible to ensure compliance with applicable regulations.

2.6.4 Biological Resource Environmental Protection Measures

- **EPM BIO-1 Material Storage:** All material stockpiling and staging areas will be located within designated landings that are outside of sensitive habitats.
- **EPM BIO-2 Avoid Spread or Introduction of Exotic Plants:** The spread or introduction of exotic plant species will be avoided by minimizing soil disturbance to areas during and following treatments. Only native plant seeds or stock will be used for erosion control, as needed. 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 treatment areas.
- **EPM BIO-3 Let Wildlife Leave Area Unharmed:** If any wildlife is encountered during treatment activities, the animal will be allowed to leave the treatment area unharmed and on its own accord.
- **EPM BIO-4 Environmental Awareness Training**: A qualified biologist will provide Environmental Awareness Training to all staff involved with vegetation treatment activities before initiation of a treatment. Training materials will be provided to any new staff over the course of a treatment project. Upon completion of the training, staff will sign a form stating that they attended the training and understand and will comply with the information presented. The training will describe the appropriate work practices necessary to effectively implement the EPMs and mitigation measures and to comply with the state and federal Endangered Species Acts and will include the identification and relevant life history information of sensitive biological resources (e.g., wildlife, plants, habitats) that may potentially occur within the Plan Area.
- **EPM BIO-5 Delineate Project Areas**: UC Berkeley will clearly delineate project areas and restrict access to work crews outside of that area to prevent impacts to adjacent sensitive biological resources.
- **EPM BIO-6 Access Plan to Minimize Ground Disturbance:** UC Berkeley will use existing roads, trails, and former logging paths and minimize ground disturbance from equipment and vehicles (e.g., wheels, tracks, skidding to landings), to the extent feasible. UC Berkeley will develop an access/implementation plan that maps and names all fire roads and/or trails that will be used to reach treatment areas and that details the starting location(s) and direction of progression of treatment in coordination with a qualified biologist approved by USFWS and CDFW.

2.6.5 Geology, Soils, and Mineral Resource Environmental Protection Measures

- **EPM GEO-1 Suspend Disturbance During and After Precipitation:** Ground-disturbing activities will not occur when soils are saturated as defined in 14 CCR 895.1, or within one week following an inch or more of rain, unless the ground is consistently firm and can support the weight of machinery or livestock (during managed herbivory) without creating ruts.

- **EPM GEO-2: Stabilize Disturbed Soil Areas:** Bare soil will not be exposed in over 50 percent of the site, and no single bare patch will be larger than 15 square feet. UC Berkeley will stabilize newly created bare soil with mulch or equivalent, to minimize the potential for erosion and sediment discharge. In these areas, mulch/chip depth will be 3-6 inches over at least 90 percent of the exposed area, and will be placed as soon as possible after treatment activities and before October 15.
- **EPM GEO-3 Minimize Erosion:** To minimize erosion, UC Berkeley will prohibit heavy equipment use where slopes are steeper than 30 percent. During managed herbivory, grazing animals will be herded out of an area if accelerated soil erosion is observed.
- **EPM GEO-4 Drain Stormwater via Water Breaks:** UC Berkeley will drain compacted and/or bare linear treatment areas capable of generating storm runoff via water breaks using the spacing and erosion control guidelines contained in Sections 914.6, 934.6, and 954.6(c) of the California Forest Practice Rules (2020). Where water breaks cannot effectively disperse surface runoff, including where water breaks cause surface runoff to be concentrated on downslopes, other erosion controls will be installed as needed to eliminate the concentration of runoff, such as application of mulch or installation of check dams. Water bars and rolling dips will be monitored and maintained for at least three years following the first winter of installation to ensure they are functioning properly.
- **EPM GEO-5 Steep Slopes**: UC Berkeley will require a Registered Professional Forester (RPF) or licensed geologist to evaluate treatment areas with slopes greater than 50 percent for unstable areas (areas with potential for landslide) and unstable soils (soil with moderate to high erosion hazard). If unstable areas or soils are identified within the treatment area, are unavoidable, and will be potentially directly or indirectly affected by a treatment, a licensed geologist (P.G. or C.E.G.) will determine the potential for landslide, erosion, of other issues related to unstable soils and identity measures that will be implemented by UC Berkeley such that substantial erosion or loss of topsoil will not occur.

2.6.6 Hazards and Hazardous Materials Environmental Protection Measures

- **EPM HAZ-1 Maintain All Equipment:** UCB will maintain all diesel- and gasoline-powered equipment per manufacturer's specifications and in compliance with all state and federal emissions requirements, as well as all equipment used for herbicide application. Maintenance records will be available for verification. Before the start of treatment activities, UC Berkeley will inspect all equipment for leaks and inspect everyday thereafter until equipment is removed from a treatment site. Any equipment found leaking will be promptly removed.
- **EPM HAZ-2 Spill Prevention and Response Plan:** UC Berkeley or the licensed Pesticide Control Advisor (PCA) will prepare a Spill Prevention and Response Plan (SPRP) before beginning any herbicide treatment activities to provide protection to onsite workers, the public, and the environment from accidental leaks or spills of herbicides, adjuvants, or other potential contaminants. The SPRP will include (but not be limited to):
  - a map that delineates staging areas, and storage, loading, and mixing areas for herbicides;
  - a list of items required in an onsite spill kit that will be maintained throughout the life of the activity; and
  - procedures for the proper storage, use, and disposal of any herbicides, adjuvants, or other chemicals used in vegetation treatment.
- **EPM HAZ-3 Comply with Herbicide Application Regulations:** UC Berkeley will obtain all required licenses and permits before herbicide application. UC Berkeley will prepare all herbicide applications to do the following:
  - Be implemented consistent with recommendations prepared annually by a licensed PCA.
  - Comply with all appropriate laws and regulations pertaining to the use of pesticides and safety standards for employees and the public, as governed by the EPA, DPR, and applicable local jurisdictions.

- Adhere to label directions for application rates and methods, storage, transportation, mixing, container disposal, PPE, and weather limitations to application such as wind speed, humidity, temperature, and precipitation.
- Be applied by an applicator appropriately licensed by the state.

- **EPM HAZ-4 Triple Rinse Herbicide Containers:** UC Berkeley will triple rinse all herbicide and adjuvant containers with clean water at an approved site, and dispose of rinsate by placing it in the batch tank for application per 3 CCR Section 6684. Disposal of non-recyclable containers will be at legal dumpsites. Disposal of all herbicides will follow label requirements and waste disposal regulations.
- **EPM HAZ-5 Minimize Herbicide Drift:** UC Berkeley will employ the following parameters during foliar spray herbicide applications to minimize drift:
  - application will cease when weather parameters exceed label specifications or when sustained winds at the site of application exceed 7 miles per hour (whichever is more conservative), as measured onsite with a hand-held anemometer or similar device immediately prior to application;
  - spray nozzles will be configured to produce the largest appropriate droplet size to minimize drift;
  - low nozzle pressures (30-70 pounds per square inch) will be utilized to minimize drift; and
  - spray nozzles will be kept within 24 inches of vegetation during spraying.
- **EPM HAZ-6 Notification of Herbicide Use in the Vicinity of Public Areas:** Signage will be posted at each pedestrian entry point notifying the public of upcoming and recent herbicide application locations, and footpaths and trails will be closed to the public during herbicide application. Signs will be posted before the start of treatment and notification will remain in place for at least 24 hours after treatment ceases.

2.6.7 Hydrology and Water Quality Environmental Protection Measures

- **EPM HYD-1 Water Quality Protections:** UC Berkeley will implement the following measures to minimize impacts to water quality from treatments:
  - Environmentally sensitive areas such as waterbodies, wetlands, or riparian areas will be identified and excluded from managed herbivory project areas using temporary fencing or active herding. A buffer of 50 feet will be maintained between sensitive and actively grazed areas.
  - No cut material will be left within 20 feet of any watercourse or swale. A watercourse is defined as any well-defined channel (including human-made channels) with distinguishable bed and bank showing evidence of having contained flowing water indicated by deposits of rock, sand, gravel, or soil. A swale is a low-lying area between high points that conveys runoff but lacks a defined bed and bank.
  - Within 50 feet of watercourses, trees will only be cut down using hand-held equipment or mechanical equipment that can be positioned 50 feet or more from a watercourse that use articulated arms. Fuels, heavy equipment, or other potentially hazardous materials will be kept at least 50 feet from watercourses to prevent accidental leaks or spills from entering the watercourse.
  - Pile burning will not be conducted within 25 feet of a watercourse.
  - Burn piles will not exceed 20 feet in length, width, or diameter, except when on landings, road surfaces, or on contour to minimize the spatial extent of soil damage.
  - Where landings are located near watercourses, brow logs and orange safety netting will be installed to prevent chip movement into watercourses or natural drainage blockages. Chips would not be allowed to accumulate around fencing and cut logs.
  - All soils, chips, and debris will be removed from ditches and drainage features of public roads at the end of each work day.

- **EPM HYD-2 Avoid Impacts to Non-Target Vegetation and Sensitive Resources from Herbicides:** UC Berkeley will implement the following measures when applying herbicides:
  - Locate herbicide mixing sites in areas devoid of vegetation and where there is no potential of a spill reaching non-target vegetation or a waterway.
  - No herbicide will be applied during precipitation events or if precipitation is forecasted to occur within 24 hours before or after treatment activities.
  - Use only herbicides labeled for use in aquatic environments when working in riparian habitats or other areas where there is a possibility the herbicide could come into direct contact with water. Only hand application of herbicides will be allowed in riparian habitats and only during low-flow periods or when seasonal streams are dry.
  - Herbicides that are not approved for use in aquatic environments would not be used, mixed, or stored within 60 feet of any surface waters, wetlands, or riparian areas.

2.6.8 Noise Environmental Protection Measures

- **EPM NOI-1 Limit Heavy Equipment Use to Daytime Hours:** Operation of heavy equipment (heavy off-road equipment, tools, and delivery of equipment and materials) will occur during daytime hours if such noise would be audible to sensitive receptors (e.g., residences) and will not be scheduled during the university's Reading/Review/Recitation Week and finals week.
- **EPM NOI-2 Maintain Equipment:** All mechanical equipment and hand-operated power tools will be used and maintained according to manufacturer specifications. All diesel- and gasoline-powered equipment will be equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations.
- **EPM NOI-3 Close Equipment Engine Shrouds.** Equipment engine shrouds will be closed during equipment operation.
- **EPM NOI-4 Limit Equipment Idling:** All motorized construction equipment will be shut down when not in use. Idling of equipment and haul trucks will be limited to 5 minutes.
- **EPM NOI-5 Notify Noise-Sensitive Receptors:** For treatment activities utilizing heavy equipment and/or chainsaws, UC Berkeley will provide advanced notice to occupants of residential land uses in the City of Berkeley that are within 215 feet of a treatment activity and occupants of residential land uses in the City of Oakland that are within 135 feet of a treatment activity. At 215 feet noise generated by mechanical and manual treatment activity would attenuate to less than 75 dB L_{eq}, which is the City of Berkeley's noise standard for nonscheduled, intermittent, short-term operation of mobile equipment. At 135 feet noise generated by mechanical and manual treatment activity would attenuate to less than 80 dB L_{eq}, which is the City of Oakland's noise standard for construction-generated noise. Notification will include anticipated dates and hours during which treatment activities are anticipated to occur and contact information, including a daytime telephone number, of a project representative. Recommendations to assist noise-sensitive land uses in reducing interior noise levels (e.g., closing windows and doors) will also be included in the notification.

2.6.9 Wildfire Environmental Protection Measures

- **EPM WIL-1 Prohibit Treatments During High Fire Danger:** Vegetation treatments will not occur during extreme fire danger conditions such as red flag warnings, as posted by the local CAL FIRE unit. UC Berkeley will define the conditions under which work can proceed. It will be UC Berkeley's responsibility to determine the fire danger before the start of each work day and may determine to limit or cease operations to mitigate wildfire risk without a red flag warning. In addition, during the dry season, a ground inspection for fire will occur within 2 hours of felling, yarding, and mechanical loading activities ceasing each day, per Section 918.8, 958.8 of the California Forest Practice Rules (2020).

- **EPM WIL-2 Require Spark Arrestors**: UC Berkeley will require all mechanized hand tools to have federal- or state-approved spark arrestors.
- **EPM WIL-3 Require Fire Suppression Tools:** UC Berkeley will require tree cutting crews to carry one fire extinguisher per chainsaw. Each vehicle would be equipped with one long-handled shovel and one axe or Pulaski consistent with PRC Section 4428. A fire suppression resources inventory will be submitted to the local CAL FIRE unit before prescribed burning as required by 14 CCR Section 918.

2.7 POTENTIAL PERMITS AND APPROVALS REQUIRED

For the proposed Identified Treatment Projects and later projects implemented under the WVFMP, the following permits and/or approvals may be needed:

Federal

- **U.S. Fish and Wildlife Service**: Compliance with Section 10 of the federal Endangered Species Act, or potentially Section 7 of the act, if federal approval of the project is necessary.

State

- **California Department of Fish and Wildlife**: Compliance with the California Endangered Species Act, incidental take authorization permits under Section 2081 of the Fish and Game Code if take of listed species is likely to occur, and Section 1602 streambed alteration notification for activities that occur within the bed or bank of adjacent waterways.
- **San Francisco Bay Regional Water Quality Control Boards**: National Pollutant Discharge Elimination System construction stormwater permit (Notice of Intent to proceed under General Construction Permit) for disturbance of more than 1 acre and discharge permit for stormwater.

Local

- **Bay Area Air Quality Management District**: Burn permits and review of smoke management plans for prescribed burns.

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3 ENVIRONMENTAL SETTING, IMPACTS, AND MITIGATION MEASURES

3.1 APPROACH TO THE ENVIRONMENTAL ANALYSIS

This EIR evaluates and discloses the environmental impacts associated with implementation of the proposed Hill Campus WVFMP, in accordance with the California Environmental Quality Act (CEQA) (Public Resources Code [PRC] Section 21000, et seq.) and the State CEQA Guidelines (California Code of Regulation, Title 14, Chapter 3, Section 1500, et seq.).

This EIR functions as both a Program EIR and a Project EIR. The program-level analysis of the WVFMP considers the full range of treatment types and activities included in the overall WVFMP to provide a broad, comprehensive analysis of environmental impacts, along with measures to mitigate these impacts, where feasible. Nine Identified Treatment Projects are proposed that would be implemented using the treatment types and activities in the WVFMP in furtherance of the objectives of the WVFMP; these projects are evaluated at a project-level of detail in the EIR.

3.1.1 Program-level Analysis of the Overall WVFMP

The EIR will facilitate streamlined CEQA review of those later vegetation treatment activities in the Hill Campus that are consistent with the WVFMP. This approach is consistent with State CEQA Guidelines Section 15168, "Program EIR," which allows for the use of a Program EIR in connection with a series of actions that can be characterized as one large project and are related to, among other things, the issuance of general criteria to govern the conduct of a continuing program or individual activities having generally similar environmental effects that can be mitigated in similar ways.

As contemplated by State CEQA Guidelines Section 15168(c), UC Berkeley will examine later proposed vegetation treatments in light of this EIR to determine whether any additional environmental review document(s) must be prepared. UC Berkeley may use the Environmental Checklist for Later Treatment Projects Under the WVFMP (Appendix B) of this EIR, or another similar documentation, to document evaluation of the site and the proposed treatments to determine whether the proposed treatment project is consistent with the descriptions in Chapter 2, "Project Description" and whether the environmental effects of the proposed treatment have been sufficiently evaluated in this EIR.

The Environmental Checklist is the prescribed approach under CEQA for consideration of whether the environmental impacts of later activities included in a program EIR have been covered and are within the scope of the program EIR, and, if not, the focus of any subsequent environmental review. This will include documenting the application of environmentally protective Environmental Protection Measures (EPMs) and relevant mitigation measures from the EIR. If the proposed treatment meets the criteria in State CEQA Guidelines Section 15168(c) to be within the scope of the program description and impact analysis, the Environmental Checklist will document this determination. The Guidelines state the criteria this way:

> If the agency finds that pursuant to Section 15162, no subsequent EIR would be required, the agency can approve the activity as being within the scope of the project covered by the program EIR, and no new environmental document would be required. Whether a later activity is within the scope of a program EIR is a factual question that the lead agency determines based on substantial evidence in the record. Factors that an agency may consider in making that determination include, but are not limited to, consistency of the later activity with the type of allowable land use, overall planned density and building intensity, geographic area analyzed for environmental impacts, and covered infrastructure, as described in the program EIR.

The most important factor is whether the later treatment activities would result in any new significant or more severe significant impacts than were addressed in the Program EIR. CEQA Guidelines Section 15162 describes criteria under A "within the scope" finding would shorten the time needed for CEQA review of later treatment activities consistent with the WVFMP, which would support the objective to increase the pace and scale of project approvals in a manner that includes environmental protections. Where a later vegetation treatment project does not qualify for a "within the scope" finding, a negative declaration, mitigated negative declaration or EIR may be prepared that focuses on the environmental impacts not adequately considered in this EIR.

3.1.2 Project-level Analysis of the Identified Treatment Projects

In addition to the programmatic analysis of WVFMP implementation, this EIR also analyzes two fuel break projects, four temporary refuge areas, and three fire hazard reduction projects in designated locations (project areas) within the Hill Campus that are identified in the WVFMP. These nine specific projects are collectively referred to as the "Identified Treatment Projects" and are studied at a project level of detail in this EIR. Upon certification of this EIR, UC Berkeley intends to implement the Identified Treatment Projects.

The near-term implementation of the Identified Treatment Projects along with the longer-term implementation of treatment activities studied at a program level, together comprise the proposed "project," as defined in State CEQA Guidelines Section 15378.

3.1.3 Analysis Contents

Sections 3.2 through 3.12 of this EIR present a discussion of existing conditions, regulatory background, environmental impacts associated with implementation of the overall WVFMP and the Identified Treatment Projects, EPMs, mitigation measures to reduce the level of impact, and residual level of significance (i.e., after application of mitigation, including impacts that would remain significant and unavoidable after application of all feasible mitigation measures). Issues evaluated in these sections consist of the environmental topics identified for review in the Notice of Preparation (NOP) for this EIR (see Appendix C).

Sections 3.2 through 3.12 follow the same general format and each section distinguished the information applicable to the program-level analysis of the overall WVFMP as well as the project-level analysis of the Identified Treatment Projects:

Environmental Setting presents the existing environmental conditions within the Hill Campus in accordance with Section 15125 of the State CEQA Guidelines. The degree of specificity under this EIR's programmatic level analysis is more generalized than the site-specific analysis of the Identified Treatment Projects, because the exact locations and proposed treatment prescription of later vegetation treatments are not yet known. Information that is applicable to the entire Hill Campus at the program level or specific to any Identified Treatment Project is identified as such, if warranted, in the description of the Environmental Setting.

Under an existing program, known as the 2020 Hill Area Fire Fuel Management Program, UC Berkeley currently undertakes ongoing vegetation treatment maintenance actions that were approved under the 2020 Long Range Development Plan EIR (2005)(refer to Section 2.4 for additional information). These ongoing treatments are considered as part of the environmental baseline, as prescribed by CEQA (see, particularly, CEQA Guidelines Section 15125(a), which describes environmental setting and baseline considerations).

Regulatory Setting presents the laws, regulations, plans, and policies that are relevant to each environmental resource. Regulations originating from the federal, state, and local levels are each discussed where applicable. When state entities, including UC Berkeley, are conducting governmental activities under the authority of state law or the state Constitution, such as treatments implemented by UC Berkeley under the WVFMP, they are exempt from local government plans, policies, and ordinances (unless a constitutional provision or statute directs otherwise). Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies.

Impact Analysis and Mitigation Measures identifies the thresholds of significance used to determine the level of significance of the environmental impacts for each resource topic, in accordance with the State CEQA Guidelines (Sections 15126, 15126.2, and 15143). The thresholds of significance used in this EIR are primarily based on the checklist presented in Appendix G of the State CEQA Guidelines, best available data, applicable regulatory standards of relevant public agencies, and professional judgment. The significance of each impact is determined by evaluating the physical changes in the environmental setting that would be caused by implementation of treatments under the WVFMP and analyzing those effects against the identified threshold. Key methods and assumptions used to frame and conduct the impact analysis as well as issues or potential impacts not discussed further (such issues for which the program would have no impact) are also described. In addition, EPMs applicable to each resource section are identified.

Impacts are organized by letter convention for each resource (e.g., in Section 3.2, "Aesthetics," impacts are numbered as follows Impact AES-1, Impact AES-2). A bold-font impact statement, a summary of each impact, and its level of significance before application of any necessary mitigation precedes the discussion of each impact. The discussion that follows the impact summary presents the substantial evidence supporting the impact significance conclusion. A significance conclusion and supporting discussion are presented separately for the overall WVFMP and the Identified Treatment Projects.

If an environmental impact cannot be avoided or maintained at a less-than-significant level assuming implementation of the SPRs, then it would be a potentially significant impact, and the EIR must describe any feasible measures that could avoid, minimize, rectify, reduce, or compensate for potentially significant adverse impacts. The measures are to be fully enforceable and adopted as a condition of approval (PRC Section 21081.6[b]). Mitigation measures are not required for effects that are determined to be less than significant. Where feasible mitigation for a potentially significant impact is available the mitigation measures are presented. Each identified mitigation measure is labeled with the same letter convention to correspond with the number of the impact that would be mitigated by the measure (e.g., Mitigation Measure AES-1 for Aesthetics). Following the mitigation measure, the measure's effectiveness at reducing the impact is described and compared again against the identified threshold to determine the level of significance after mitigation. Where sufficient feasible mitigation is not available to reduce an impact to a less-than-significant level, or where UC Berkeley may lack the ability to ensure that the mitigation is implemented when needed, the impact is identified as remaining "significant and unavoidable."

3.1.4 Terminology Used in the EIR

Following are key terms used in this EIR to describe important components of the WVFMP:

Identified Treatment Project(s): two fuel break projects, four temporary refuge areas, and three fire hazard reduction projects in designated locations (project areas) within the Hill Campus that UC Berkeley intends to implement upon certification of the EIR.

Treatment type: evacuation support, fuel break, temporary refuge area, fire hazard reduction (each is described in Section 2.5.1 of Chapter 2 "Program Description")

Treatment activity: prescribed burning (includes broadcast burning of vegetation, but also refers to pile burning as a biomass disposal method), manual treatments, mechanical treatments, managed herbivory, herbicide application (each is described in Section 2.5.2 of Chapter 2 "Program Description"); any of these activities could be used in various combinations to implement a treatment type in the Hill Campus.

Qualifying treatment (also qualifying project): a later vegetation treatment project that is consistent with the treatment methods described in this EIR, would not result in new or substantially more severe significant effects relative to those identified in this EIR, and would otherwise be considered within the scope of this EIR pursuant to State CEQA Guidelines Section 15168(c)(2).

This EIR uses the following terminology to describe environmental effects of the WVFMP:

Less-than-Significant Impact: An impact is considered less than significant when it, either on its own or with incorporation of SPRs, does not exceed the defined thresholds of significance (no mitigation required), or that is potentially significant and can be reduced to less than significant through implementation of feasible mitigation measures.

Significant Impact or Potentially Significant Impact: A potentially significant impact is an environmental effect that may cause a substantial adverse change in the physical conditions of the environment. In this EIR, a potentially significant impact is treated as if it were a significant impact. "Potentially" is used to convey that not every qualifying treatment will result in impacts to the reasonably maximum degree that they are disclosed in this EIR; it is expected that most treatments would result in effects that are less severe than those disclosed, but some treatments could result in significant impacts consistent with the severity described in this EIR. Potentially significant impacts are identified by the evaluation of treatment effects in the context of specific significance thresholds. Mitigation measures and/or alternatives are identified to reduce these effects to the environment below the threshold of significance where feasible.

Significant and Unavoidable Impact: An impact is considered significant and unavoidable if it would result in a substantial adverse change in the environment that cannot be feasibly avoided or mitigated to a less-than-significant level. If a lead agency decides to approve a project with significant unavoidable impacts, it must adopt a statement of overriding considerations to explain its actions (State CEQA Guidelines, Section 15093(b)).

Mitigation Measures: State CEQA Guidelines (Section 15370) define mitigation as:

a) avoiding the impact altogether by not taking a certain action or parts of an action;

b) minimizing impacts by limiting the degree of magnitude of the action and its implementation;

c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment;

d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and

e) compensating for the impact by replacing or providing substitute resources or environments.

3.1.5 Resource Areas with Impacts Found Not to Be Significant

Under CEQA and the State CEQA Guidelines, a lead agency may limit an EIR's discussion of environmental effects when they are not significant (Public Resources Code [PRC] Section 21002.1(e); State CEQA Guidelines sections 15128 and 15143). Based on a review of the potential effects of the proposed project and as summarized below, UC Berkeley determined that agriculture and forestry resources, energy, land use and planning, mineral resources, population and housing, public services, transportation, and utilities and service systems do not require detailed evaluation in the EIR. Please refer to the Initial Study in Appendix C for additional explanation regarding these resource areas.

AGRICULTURE AND FORESTRY RESOURCES

The Plan would implement treatment activities within the UC Berkeley Hill Campus, which consists primarily of natural open space along with a few existing buildings. The entirety of the Plan Area is zoned for residential use by both the City of Berkeley and the City of Oakland, which does not include provisions for forest land or timberland. Treatment activities that would occur within the Plan Area would alter forest land through the removal of vegetation, but the area would generally continue to support 10 percent of native tree cover, thereby maintaining consistency with the definition of forest land as defined by PRC Section 12220(g). The Plan Area does not contain any land under a Williamson Act contract or designated as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. The Plan would have no impact on agricultural resources and a less than significant impact on forestry resources.

ENERGY

Plan implementation would result in short-term fossil fuel energy consumption in the engines of vehicles and equipment used for some treatment activities. However, energy consumption would be temporary, and increases in vehicle fuel consumption attributable to Plan implementation would comply with the UC Berkeley *2025 Carbon Neutrality Planning Framework*. When feasible, UC Berkeley would incorporate alternative fuels during application of treatment activities. Additionally, occasional utilization of a gasifier would generate renewable energy by converting some of the vegetation removed during treatment activities to electricity and would, therefore, offset some energy consumed during Plan implementation. Given the need for the project to increase public safety and improve habitat conditions in the Plan Area, this would not be an inefficient, wasteful, or unnecessary consumption of energy resources. In addition, the Plan would not conflict with state or local plans for renewable energy or energy efficiency. Therefore, Plan implementation would have a less than significant impact on energy resources.

LAND USE AND PLANNING

Implementation of the Plan would not alter the existing land use of the Plan Area, which is designated as Open Space by the City of Berkeley General Plan and as a Resource Conservation Area by the City of Oakland General Plan. The Plan would be consistent with the UC Berkeley 2020 Long Range Development Plan (LRDP) and would not result in construction of physical barriers that would change the connectivity between developed areas or physically divide an established community. Therefore, no land use impact would occur.

MINERAL RESOURCES

There are no significant mineral deposits present or likely to be present in the Plan Area. Additionally, the Plan Area is not designated as a locally important mineral resource recovery site in the City of Berkeley General Plan or City of Oakland General Plan. Therefore, Plan implementation would have no impact on mineral resources.

POPULATION AND HOUSING

The Plan Area includes several public and research facilities, but the majority of the area remains undeveloped. No residential land uses are located within the Plan Area, and no persons or homes would be displaced as a result of Plan implementation. The Plan would not include construction of new housing, removal of housing, or new commercial development. The Plan would reduce wildfire risk along evacuation routes, but such activity would not induce population growth. The Plan would also not extend roads or other infrastructure to new areas that would induce growth in new locations.

Employment needs for Plan implementation would be minimal (up to 15 personnel per treatment application) and would not result in substantial relocation of employees to the area because employment needs would be met by existing UC Berkeley staff or private contractors. Because implementation of the Plan would not induce any population growth or displace existing homes, the Plan would have no impact related to population and housing.

PUBLIC SERVICES

Fire protection services for the UC Berkeley Campus, including the Plan Area, are provided by the Berkeley Fire Department (BFD). Alameda County Fire Department (ACFD) Station Number 19 also provides fire protection services to Lawrence Berkeley National Laboratory and portions of the UC Berkeley campus. The Plan does not include development of new residences or the creation of permanent jobs that would require increased fire protection services. Additionally, implementation of treatment activities under the Plan is intended to reduce the threat of wildfires and facilitate emergency access in the event of a fire.

The University of California Police Department (UCPD) provides police services to all UC Berkeley properties, including the Plan Area. The Plan does not include development of new residences or the creation of permanent jobs that would require increased police protection services or expansion of existing police facilities.

Park and recreation resources within the Plan Area include Strawberry Canyon Recreation Area as well as the fire trails within the Hill Campus. Claremont Canyon Regional Preserve is located along the Plan Area's southern boundary. The Plan does not include development of new residences that would generate new residents who would require new or expanded park facilities.

The Plan would not induce population growth because it would not include development of new residences or creation of permanent jobs. Therefore, the Plan would not result in an increased demand for any other public facilities including schools, libraries, and community centers.

The Plan would have no impact on fire, police, park, school, or other public facilities.

TRANSPORTATION

Treatment activities would not alter existing or planned transit, bicycle, or pedestrian facilities or result in long-term operational increases in vehicular traffic to the Plan Area. Occasional road closures for Plan implementation would be temporary and lane closures would be accompanied by traffic control signage and flaggers. Treatment-related traffic would include heavy-vehicle trips to haul equipment and materials, trips associated with workers commuting to and from the treatment areas, and transporting biomass to campus facilities. Plan implementation would not generate substantial worker-related trips or generate substantial pedestrian, bicycle, and transit demand because of the temporary, sporadic nature of the treatment activities and the small crew size needed per treatment. Plan implementation would not approach 110 vehicle trips per day, which is the limit at which a project is presumed to cause a less than significant impact. Therefore, Plan implementation would not adversely affect the performance of the circulation system and would not conflict with any applicable transportation plans, ordinances, or policies, including the CEQA Guidelines section 15064.3(b) for vehicle miles traveled. This impact would be less than significant.

Plan implementation would not require construction, re-design, or alteration of any public roadways, and vegetation treatments would not occur within any road right-of-way. Additionally, because the Plan would not involve new development within the Plan Area, Plan implementation would not result in a reduction in the adequacy of emergency access. During treatment activities, UC Berkeley would coordinate with adjacent facilities and local fire departments to plan emergency access to the Plan Area. After vegetation treatment is completed, emergency access would be improved because emergency access routes would be cleared of vegetation. Therefore, Plan implementation would have no impact on hazards due to design features, incompatible vehicular use, or emergency access.

UTILITIES AND SERVICE SYSTEMS

UC Berkeley owns and maintains the water lines, sanitary sewer infrastructure, and stormwater utilities serving the Plan Area. Non-hazardous solid waste generated within the Plan Area is collected and hauled by UC Berkeley's Campus Recycling and Refuse Division. Approximately 90 percent of energy used by UC Berkeley is produced on-campus in a cogeneration plant, and additional energy needs are delivered by Pacific Gas & Electric (PG&E).

Treatment activities would not involve development of residential communities or induce population growth in an area that would require the expansion or construction of water infrastructure, wastewater treatment facilities, storm drainage facilities, electric power, natural gas, or telecommunications facilities. Plan implementation would not result in increased water demand or affect water supplies because only a minimal amount of water would be required during certain treatment activities such as for prescribed burning and dust control. The Plan would not include construction of restroom facilities but may supply portable restrooms for work crews. Waste would be hauled off-site to a designated publicly owned treatment facility. The Plan's wastewater treatment needs would not exceed the capacity of any wastewater treatment provider because waste created would be minimal, and publicly owned treatment facilities are responsible for implementing permit programs for hauled waste to ensure they have an adequate treatment capacity.

Plan implementation would include the removal of trees and vegetation. Most of the biomass created would be incinerated using an air curtain burner or chipped and spread on-site,. The air curtain would likely be located at UC Berkeley's Richmond Field Station and all biomass to be incinerated by the air curtain would be hauled to this location. UC Berkeley has adequate capacity to process any biomass generated from treatments. All personal refuse generated by work crews during treatment activities would be disposed of in the nearest solid waste receptacle.

Plan implementation would not conflict with federal, state, and local statutes or regulations related to solid waste. The Plan would have no impact on utilities and service systems, including water supplies, solid waste, wastewater treatment, stormwater drainage, electric power, natural gas, and telecommunication facilities.

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3.2 AESTHETICS AND VISUAL RESOURCES

This section evaluates the potential for implementation of the WVFMP, including the Identified Treatment Projects, to affect aesthetic and visual resources. It describes the visual setting of the Plan Area and evaluates the impacts that could occur to visual resources as a result of WVFMP implementation. Information used in this section was obtained from publicly available sources and widely used visual assessment guidelines.

Comments received on the Notice of Preparation related to aesthetics and visual resources included the question of whether removal of vegetation should be considered a significant impact and the consideration of long-term impacts versus temporary impacts. Other comments received addressed the effects of tree removal on light and glare, and nighttime lighting conditions, and the loss of eucalyptus trees as a visual resource. The project’s effect on visual resources, including temporary and long-term impacts, are addressed in Impacts AES-1 and AES-2 below. Impacts related to light, glare, and nighttime lighting are addressed in Impact AES-3 below.

3.2.1 Environmental Setting

GENERAL METHODOLOGY FOR VISUAL IMPACT ANALYSIS

When evaluating the impacts of vegetation treatments on the visual environment, the focus is on three overarching parameters: existing visual conditions; how these would be altered by implementing a treatment; and the significance of the change on scenic qualities of the landscape and publicly available viewpoints. Visual resources considered in an evaluation include those features in the natural and cultural landscapes that comprise the visible world and contribute to a person’s understanding of and reaction to the scene before them. Visual resources include both natural elements, such as topography, vegetation, and water, and constructed features, such as earthworks, roads, and structures.

This visual analysis considers visual quality, viewer sensitivity, viewer exposure (visibility, number of viewers, duration of view), and visual change. These are ranked as being high to low. These and other elements of the visual analysis methodology are described below.

Visual quality is an expression of the visual impression or appeal of a given landscape and the associated public value attributed to the resource. A high rating is generally reserved for landscapes viewers might describe as picture-perfect. Landscapes rated high generally are memorable because of the way the components combine in a visual pattern. In addition, those landscapes are free from encroaching elements that would compromise the landscapes’ visual integrity. In contrast, landscapes rated low often are dominated by visually discordant alterations that have been introduced by humans. Visual quality is evaluated using the approach to visual analysis adopted by the Federal Highway Administration and Caltrans, employing the concepts of vividness, intactness, and unity.

- **Vividness:** The extent to which the landscape is memorable. This is associated with the distinctiveness, diversity, and contrast of visual elements. A vivid landscape makes an immediate and lasting impression on the viewer.
- **Intactness:** The integrity of “visual order” in the landscape, which is the extent to which the natural landscape is free from visual intrusions. If all the various elements of a landscape appear to "belong" together, there will be a high level of intactness.
- **Unity:** The extent to which visual intrusions are sensitive to and in visual harmony with the natural landscape. Unity, in other words, represents the degree to which the visual elements maintain a coherent visual pattern.

Visual quality is evaluated based on the relative degree of vividness, intactness, and unity, as modified by its visual sensitivity. High quality views are highly vivid, relatively intact, and exhibit a high degree of visual unity.

Viewer sensitivity represents the reaction of a viewer to landscape changes in the viewshed (defined as the area visible from a fixed vantage point). For example, viewers have a high expectation for scenic quality of areas designated as a scenic area, scenic travel corridor, park, open space, recreational, and residential areas. Travelers on non-scenic highways and roads generally have moderate viewer concerns and expectations. Viewer sensitivity is generally lower for more heavily urbanized, non-residential areas, such as commercial or industrial uses.

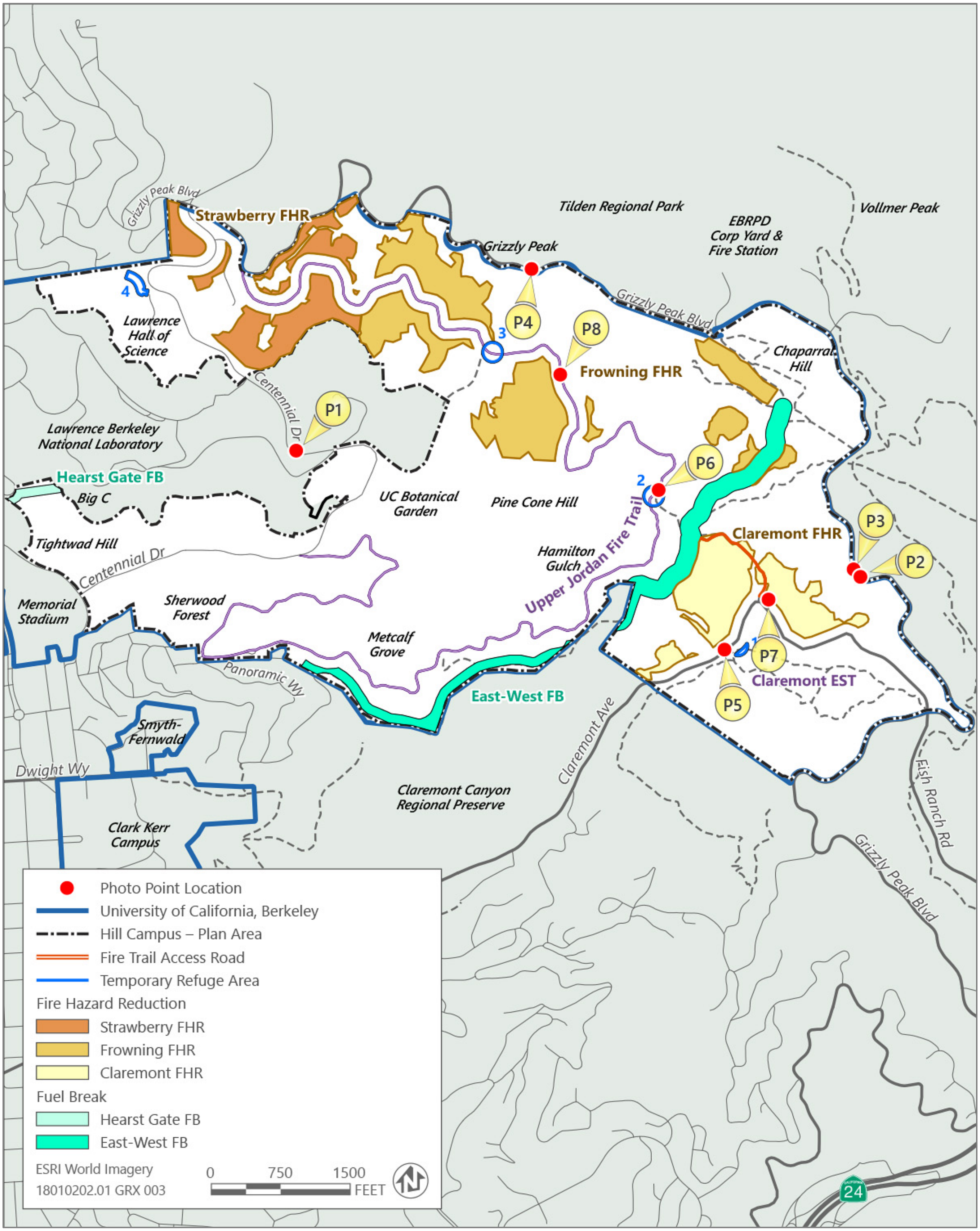
Viewer exposure is a function of three elements: visibility, number of viewers, and duration of view. These elements are described below:

- **Visibility** is a measure of how well an object or site can be seen. It depends on the angle or direction of the view; extent of visual screening; and the topographical relationship between the object or site and existing vantage points. Visibility is determined by considering any obstructions that may be in the sightline, such as trees and other vegetation, buildings, landforms, and haze or fog. Distance becomes a factor; with increasing distance from the viewer, objects become less prominent in the view and less clearly distinguishable.
- **Number of viewers** is a measure of the number of viewers per day who would have a view of the proposed activity. As indicated in Appendix G of the State CEQA Guidelines, visual analysis focuses on public viewpoints, which emphasize locations with higher numbers of accessible viewers (as opposed to private views, such as residential viewers).
- **Duration** of view is the amount of time available to view the site or activity. For example, a high or extended view of a site may be 2 minutes or longer. In contrast, a low or brief duration of view occurs in a short amount of time — generally less than 10 seconds. For stationary locations, such as public vista points, the duration is extended. For travelers on a highway, the duration may be very short.

Visual Change is a function of contrast, dominance, and view blockage or disruption. Contrast and dominance contribute more to the degree of visual change than view disruption.

- **Contrast** concerns the degree to which a treatment's visual characteristics or elements — such as its form, line, color, and texture — differ from the same visual elements in the existing landscape. The degree of contrast can range from low to high. A treatment resulting in forms, lines, colors, and textures similar to those of the existing landscape is more readily visually absorbed. When characteristics or elements are similar to those of the existing condition, a treatment or treated site is more capable of being accepted in the landscape as compared to a landscape in which similarities are absent. Generally, visual absorption is inversely proportional to visual contrast.
- **Dominance** is a measure of the proportion of the total field of view occupied by a treatment, a feature's apparent size relative to other visible landscape features, and the conspicuousness of the feature because of its location or position in the view. A feature's level of dominance is lower in a panoramic setting than in an enclosed setting with a focus on the feature itself. As the distance between a viewer and a feature increases, its apparent size decreases, decreasing its dominance. Objects seen against the sky are more prominent or dominant than objects viewed against trees, landforms, and buildings.
- **View blockage** is concerned with the extent to which previously visible landscape features become blocked from view. View disruption also occurs when view continuity is interrupted, such as when a treatment might break the line of a sweeping vista.

The description of the existing visual setting of the Plan Area is based on site visits conducted by Ascent, photographs of the Plan Area provided by UC Berkeley and Swaim Biological, Inc., and information from the UC Berkeley's 2020 Long Range Development Plan EIR. The locations of the photographs used in the following setting are shown in Figure 3.2-1.



Source: Data downloaded from University of California, Berkeley in 2019

Figure 3.2-1 Photographic Locations

SCENIC VIEWS AND VISTAS

A scenic view is a high-quality visual environment experienced beyond an observer's immediate surroundings. Scenic views are often available along trails and roads. For a hiker or roadway traveler, a scenic view would not include only the trail or road, but also the terrain immediately surrounding the trail or road.

Scenic vistas are broad, long-range scenic views that can be described as panoramic and having exceptional landscape-scale scenic quality. Sometimes, scenic vistas are recognized by public agencies through designation with protective policies in land management plans or placement of special destinations for viewers, such as an elevated vista point.

EXISTING VISUAL SETTING

Overall WVFMP

The 800-acre Hill Campus is primarily undeveloped with vegetation ranging from open grasslands to heavily forested areas. Development within the Hill Campus includes campus public and research facilities that are concentrated along Centennial Drive between Grizzly Peak Boulevard and Stadium Rim Way in the western portion of the Hill Campus. Additional development exists adjacent to the Plan Area, including the Lawrence Berkeley National Laboratory (LBNL) and areas of residential development. The western portion of the Plan Area also includes the developed Strawberry Canyon Recreation Area that includes a clubhouse, pools, and the adjacent Witter and Levine-Fricke sports fields.

<u>Visual Character and Quality</u>

From a base elevation of roughly 400 feet above sea level at its western edge, the Hill Campus rises to nearly 1,800 feet above sea level at Chaparral Hill at its eastern edge. Slopes range from moderate to steep, but overall the terrain is rugged. The western third of the Hill Campus abuts low-density private residential areas to the north and south, while the eastern two-thirds abuts the largely undeveloped public lands of the East Bay Regional Park District (EBRPD) and the East Bay Municipal Utility District.

Areas within the UC Botanical Garden and around the Lawrence Hall of Science support a wide variety of native and non-native trees, shrubs, groundcovers, and turf. Large tracts of eucalyptus and conifer also form a dominant part of the visual landscape within the Plan Area. Stands of blue gum eucalyptus are spread throughout the Strawberry and Claremont Canyon watersheds. The primary use of the Hill Campus is natural open space, including 300-acres, designated as an Ecological Study Area, maintained by UC Berkeley for purposes of education and research. Vegetation throughout the Plan Area includes areas of oak-bay woodland, north coastal scrub, remnants of oak savanna and native grasslands, and riparian scrub and woodland as well as patches of eucalyptus forest that exhibit a high degree of unity and intactness. Generally, there is little built-environment intrusion relative to the expanse of natural areas. Therefore, overall visual character and quality are considered moderate to high. In addition, as noted in the 2020 LRDP, areas of eucalyptus trees at the university have a strong visual identity (UC Berkeley 2005), and are considered by some to be a visual resource as a part of the aesthetic of the Bay Area.

Public viewer groups of and within the Plan Area include recreational users of the Hill Campus and adjacent recreation facilities, students and staff of UC Berkeley, motorists traveling through and adjacent to the Hill Campus, and residents located adjacent to the Hill Campus. Viewer sensitivity and exposure varies by viewer group from low (e.g., commuting motorists) to high (e.g., recreationists using the Plan Area).

<u>Scenic Views and Vistas</u>

The generally steep topography of the Plan Area and presence of public roads and trails provide scenic vistas with high quality scenic views from the Plan Area, although they are limited in number because of the dense and mature forest that covers large swaths of the Plan Area. Long-range panoramic views of the San Francisco Bay are available from the Lawrence Hall of Science, Panoramic Hill, Strawberry Canyon, as well as from points along the Upper Jordan Fire Trail and Grizzly Peak Boulevard. As shown in Figure 3.2-2 through Figure 3.2-5, views from these vistas include vegetated hillsides in the foreground, and the expansive San Francisco Bay frames the background. Views are highly vivid and intact and exhibit high scenic quality.

Source: Ascent Environmental 2020

Figure 3.2-2 View from Centennial Drive in the Vicinity of the UC Berkeley Botanic Garden – P1

Source: Ascent Environmental 2020

Figure 3.2-3 View along Grizzly Peak Boulevard above Claremont Canyon – P2

Source: Ascent Environmental 2020

Figure 3.2-4 View of Claremont Canyon and Bay Area from Grizzly Peak Boulevard – P3

Source: Ascent Environmental 2020

Figure 3.2-5 View of Strawberry Canyon from Grizzly Peak Boulevard – P4

In addition, the Caltrans Scenic Highway Program identifies State Route (SR) 24 as a state scenic highway as it travels southwest from the city of Walnut Creek to Fish Ranch Road in the City of Oakland (Caltrans 2020b). Although it is approximately 0.50 mile from the Plan Area at its nearest point, steep topography and heavy vegetation visually separate SR 24 from the Plan Area.

Existing Light and Glare

Existing sources of nighttime light on campus include lights along streets, walkways, and in parking lots that are associated with developed areas on the northwestern edge of the Campus Park, as well as lighting associated with athletics facilities including Memorial Stadium and those in the Strawberry Canyon Recreation Area. These lighted areas are set among stands of pine and eucalyptus trees. Sources of daytime glare are vehicles on campus roads and parking lots. More urbanized areas to the west of the Hill Campus contain varied light sources, such as streetlights, car head lights, and are sources of sky glow (sky glow is an area-wide illumination of the night sky from human-made light sources). Light and glare are low near most trails and forested areas in the remainder of the Plan Area.

Viewer Sensitivity

Viewer sensitivity in relation to the Hill Campus is considered high since the landscape consists of expanses of open space dominated by significant stands of mature native and non-native trees, interspersed with areas of shrublands and grasslands along with scenic vistas of the Bay Area from viewpoints along roads and trails within the Plan Area.

Viewer Exposure

Viewer exposure is a function of three elements: visibility, number of viewers, and duration of view. These elements, as related to the Plan Area, are described below:

Visibility. Visibility of the Hill Campus varies according to the viewing location. Visibility of interior and exterior views are often partially or fully blocked by trees and shrubs. Portions of the Hill Campus are visible from areas adjacent to the Plan Area, including adjacent residential areas, the UC Berkeley Campus Park to the west, and adjacent parks and open space areas, including Tilden Regional Park to the east. The Plan Area includes the developed recreation areas with interior views of the Plan Area, including Strawberry Canyon Recreation Area, and the adjacent Witter and Levine-Fricke sport fields. Passive recreation facilities such as hiking trails, including Jordan Fire Trail and East-West Trail and fire roads have views interior to the Plan Area. Other views are from roadways within the Hill Campus, including overlook pullouts along Grizzly Peak Boulevard that provide scenic vistas of the UC Berkeley campus, and the Bay Area.

Number of Viewers. The recreational user group includes UC Berkeley students, and residents from nearby Bay Area towns and cities, and other areas. Other viewers are visitors to Lawrence Hall of Science, motorists commuting through the area or as sightseers and motorists en route to recreational areas on the Hill Campus or to Tilden Regional Park and other adjacent recreation facilities.

The upper, east portion of the Hill Campus includes several heavily used trails that connect with trails in the adjacent EBRPD lands. Many points within the Hill Campus offer magnificent views of the San Francisco Bay and Golden Gate Bridge. Unimproved dirt fire trails provide emergency vehicle and maintenance access, as well as recreational access within the Plan Area. These fire trails include the East-West Trail and Upper and Lower Jordan Fire Trails, which are heavily used for recreation and dog walking.

Duration of Views. The duration of views vary according to visitor activity. Drivers and passengers in automobiles have shorter duration views than visitors engaged in recreational activities such as hiking and nature enjoyment on the Plan Area’s trails, who would have extended duration views.

Identified Treatment Projects

Visual Character and Quality

The visual characteristics of the Identified Treatment Projects are largely the same as described for the overall WVFMP above. A detailed description of visual quality and character, viewer groups, viewer sensitivity, and viewer exposure for each of the Identified Treatment Projects is provided below and summarized in Table 3.2-1. Because TRA

4 is located entirely within an existing parking area, and no treatments resulting in visual change would occur, it is not discussed further in this section.

Table 3.2-1 Existing Visual Conditions in the Identified Treatment Project Areas

Identified Treatment Project	Existing Visual Quality	Viewer Groups	Viewer Sensitivity	Viewer Exposure
East-West FB	Moderate	Residents	High	High
	Moderate	Recreationists	High	Moderate/High
	Moderate	Motorists	Low/Moderate	Low/Moderate
Hearst Gate FB	Moderately Low	Students	Moderate	High
	Moderately Low	UC Berkeley Faculty and Employees	Moderate	High
	Moderately Low	Motorists	Low/Moderate	Low
TRA 1	Moderately High	Recreationists	Moderately High	High
	Moderately High	Motorists	Moderate	Moderate
TRA 2	Moderately High	Recreationists	High	High
TRA 3	Moderately High	Recreationists	High	High
Strawberry FHR	Moderate	Recreationists	Moderate	High
	Moderate	Motorists	Moderate	Moderate
Frowning FHR	Moderately High	Recreationists	High	High
	Moderately High	Motorists	Moderate	Moderate
Claremont FHR	Moderately High	Recreationists	High	High
	Moderately High	Motorists	Moderate	Moderate

Notes: FB = fuel break, FHR = fire hazard reduction, TRA = temporary refuge area. Because TRA 4 would be located entirely within an existing paved parking area and no treatments or associated visual changes would occur, it is not included in this table.

Source: Ascent Environmental, 2020

East-West Fuel Break

The proposed East-West FB is located on Claremont Ridge between the UC Berkeley Hill Campus and the Claremont Canyon Regional Preserve. This treatment site extends along the ridge from Panoramic Way to Frowning Ridge and parallels the East-West Trail.

- Public Views: Public views of this treatment site include middle ground views from residential streets south of the Plan Area on Alvarado Ridge and from Grizzly Peak Boulevard; and foreground views from the East-West Trail and other trails in the vicinity of Grizzly Peak Boulevard. Views are partially screened by surrounding vegetation and vegetation along the residential streets on the south side of Claremont Canyon and along Grizzly Peak Boulevard. The ridge top is not visible from Claremont Avenue because of terrain and dense vegetation on the hill side above the road. The treatment site may be partially visible from overlook locations along Grizzly Peak Boulevard, which provide scenic panoramic views of Bay Area that include the San Francisco Bay, the City of San Francisco, the Golden Gate, and Marin Headlands.
- Quality of Views: Panoramic vistas from the East-West FB are of hillsides and canyon with mixed vegetative patterns contrast with distant views of urban areas and San Francisco Bay. These vistas provide moderate to high vividness. Views of and within the treatment area have few intrusive features resulting in a moderate level of intactness. Visual elements within the treatment area generally maintain a coherent visual pattern, with areas of trees and shrubs blending with scattered grassy areas and areas of eucalyptus trees, resulting in moderately high level of unity. The overall visual quality of the treatment site is considered moderate.
- Viewer Groups: Residents on Alvarado Ridge to the south, visitors to recreational areas, and motorists traveling on Grizzly Peak Boulevard.

- **Viewer Sensitivity:** Viewer concern or sensitivity is considered high. Generally, residents and recreationists have high concern for their visual environment because it is a major factor in their enjoyment of the environment and their activities. The closer the viewer is to the location of the treatment project, the higher the sensitivity. Therefore, those using the East-West Trail will have the most exposure and the highest sensitivity to visual change.
- **Viewer Exposure:** The duration of views would vary according to visitor activity. Drivers and passengers in automobiles would have short duration views, while visitors engaged in recreational activities, such as hiking and nature enjoyment on the Plan Area's trails, would have extended duration views.

Hearst Gate Fuel Break

The proposed Hearst Gate FB is located between the Hill Campus and the Hearst Gate to LBNL.

- **Public Views:** The Treatment Site is visible from areas near sports facilities on the UC Berkeley's Campus Park, from Cyclotron Road, and from parking lots located on the LBNL campus above the treatment site and near Bowles Hall below the treatment site.
- **Quality of Views**: The treatment site is on a steep hill between Hearst Gate and the LBNL parking lot. The site is vegetated with mature eucalyptus and oak trees with a shrubby understory and is surrounded by open, sparsely vegetated slopes, buildings located on the LBNL campus, and parking lots. The treatment site does not present a scenic vista, but the vegetation serves to partially screen views of the low rise and industrial style LBNL structures from UC Berkeley campus views. Views lack vividness since no scenic vistas are in the area. Roads, parking lots and structures visible in the surrounding area result in low levels of unity and intactness and detract from the visual quality. The overall visual quality of the treatment site is considered moderately low.
- **Viewer Groups**: Viewers would include students, faculty, UC Berkeley employees moving between parking lots and nearby campus facilities including residence halls, Hearst Greek Theatre; and drivers using Cyclotron Road en route to and from LBNL.
- **Viewer Sensitivity:** Because of its proximity to Campus Park and to facilities within the Plan Area, viewers would likely be engaged in work or study related activities and would be only moderately sensitive to views of the site.
- **Viewer Exposure:** The duration of views would vary according to visitor activity. Motorists entering and leaving the area would have brief exposure to views and their focus would be on driving and roadways. Other viewers walking to and from parking lots or buildings would have longer duration views, and may be more aware of the visual environment and views of the treatment site.

Temporary Refuge Area 1

The proposed TRA 1 is located on the southeast side of Claremont Avenue at Signpost 29, shown in Figure 3.2-6.

- **Public Views:** Views of the site are from the perspective of motorists and passengers traveling east or west on Claremont Avenue and from hiking trails within Claremont Canyon Regional Preserve.
- **Quality of Views:** Views of the TRA 1 consist of a meadow opening in the heavily wooded area along the road. The foreground view is of the meadow area with an inconspicuous metal gate across the south side of the road and a narrow unpaved road providing access to trails within the Claremont Canyon Regional Preserve. A dense stand of mixed trees and shrubs borders the meadow. A tall stand of mature eucalyptus trees visible in the middle ground on the hill above the meadow and forested hillsides and the ridge top are visible in the background. The view, in the direct line of site of eastbound travelers, provides a point of interest and scenic contrast. Overall, the landscape has few intrusive features, other than the roadway, resulting in a moderately high level of intactness. Visual elements within the treatment area generally maintain a coherent visual pattern, with areas of trees and shrubs blending with meadow area, resulting in a moderately high level of unity. The overall visual quality of the treatment site is considered moderately high.
- **Viewer Groups**: Primary viewers are motorists and passengers traveling eastbound on Claremont Avenue and recreational users of Claremont Canyon Regional Preserve lands.

- **Viewer Sensitivity:** Viewer sensitivity is considered moderately high because of the direct line of sight of TRA 1 for travelers on Claremont Avenue and because of the recreational use of the trail access area.
- **Viewer Exposure:** Viewer exposure would be of short duration for motorists and passengers but would be of long duration for recreational users of the trails.

Source: Ascent Environmental 2020

Figure 3.2-6 View of Claremont Canyon at Mile Post 29 on Claremont Avenue – P5

Temporary Refuge Area 2

The proposed TRA 2 is located along the Upper Jordan Fire Trail at Signpost 32, as shown in Figure 3.2-7.

- **Public Views:** Public views of this treatment site include foreground and middle ground views from the East-West Trail and other trails in the vicinity. Views from Grizzly Peak Boulevard are partially screened for drivers by roadside vegetation. However, the treatment site may be partially visible from overlook pullouts along Grizzly Peak Boulevard.
- **Quality of Views**: Views of the treatment site on Upper Jordan Fire Trail include Strawberry Canyon and Frowning Ridge, and views of the Bay Area to the west. These views are partially screened by vegetation. Views of mixed vegetative patterns in the canyon are of contrasting moderate vividness. Overall the landscape has few intrusive features resulting in a high level of intactness. Visual elements within the TRA area generally maintain a coherent visual pattern, with uninterrupted stands of eucalyptus and other trees and shrubs resulting in a moderate to high level of unity. The overall visual quality of the treatment site is considered moderately high.
- **Viewer Groups:** Primary viewers are visitors engaged in recreational activities, hiking the East-West Trail or sightseeing along Grizzly Peak Boulevard.
- **Viewer Sensitivity:** Viewer concern or sensitivity is considered high. Generally, residents and recreationists (visitors and residents of the area) have high concern for their visual environment because it is a major factor in their enjoyment of the environment and their activities. The closer the viewer is to the location of the TRA 2 site the higher the sensitivity. Therefore, those using the Upper Jordan Fire Trail will have the most exposure and the highest sensitivity to visual change.

Source: Ascent Environmental 2020

Figure 3.2-7 Panoramic view of Upper Jordan Fire Trail in the vicinity of Temporary Refuge Area 2 Treatment Site – P6

- **Viewer Exposure:** The duration of views would vary according to visitor activity. Visitors engaged in recreational activities, such as hiking and nature enjoyment on the Plan Area's trails, would have extended duration views.

Temporary Refuge Area 3

The proposed TRA 3 is located south of and adjacent to the Upper Jordan Fire Trail, and is aesthetically similar to TRA 2, which is shown in Figure 3.2-7.

- **Public Views:** Public views of this treatment site include foreground and middle ground views from the Upper Jordan Fire Trail and other trails in the vicinity. Views of the treatment site may be partially visible from overlook pullouts along Grizzly Peak Boulevard.
- **Quality of Views**: Views of the treatment site are partially screened by vegetation. The treatment site is prominent in foreground views along the Jordan Fire Trail; however, overall there are few other intrusive features resulting in a moderately high level of intactness. Visual elements within the TRA generally maintain a coherent visual pattern, with uninterrupted stands of eucalyptus and other trees and shrubs resulting in a moderate to high level of unity. The overall visual quality of the treatment site is considered moderately high.
- **Viewer Groups**: Primary viewers are visitors engaged in recreational activities, including hiking the Jordan Fire Trail.
- **Viewer Sensitivity:** Viewer concern or sensitivity is considered high. Generally, residents and recreationists (visitors and residents of the area) have high concern for their visual environment because it is a major factor in their enjoyment of the environment and their activities. The closer the viewer is to the location of the TRA site the higher the sensitivity. Therefore, those using the Jordan Fire Trail will have the most exposure and the highest sensitivity to visual change.
- **Viewer Exposure:** The duration of views would vary according to visitor activity. Visitors and residents engaged in recreational activities, such as hiking and nature enjoyment, would have extended duration views.

Strawberry Fire Hazard Reduction

The proposed Strawberry FHR encompasses 24 acres in the northwesternmost part of the Plan Area in Strawberry Canyon near upper Centennial Drive and Upper Jordan Fire Trail.

- **Public Views**: Public views of the Strawberry FHR include views from roads (Centennial Drive, Grizzly Peak Boulevard), views from research facilities in the vicinity of Centennial Drive and Grizzly Peak Boulevard, and views from the Upper Jordan Fire Trail.
- **Quality of Views**: Views of the FHR are composed primarily of stands of pine and eucalyptus trees lining the roads and trails with partially screened views of research facility buildings within the Plan Area and in the LBNL area, as well as nearby residential structures. Distant scenic vistas of the surrounding area are largely blocked by the

vegetation and structures. Intactness and unity are considered moderate due to screening effect of the extensive stands of trees that soften views of built-environment features. The overall visual quality of the treatment site is considered moderate.

- Viewer Groups: Primary viewers are motorists on Centennial Drive en route to the residential area to the northwest of the Plan Area, employees en route to the research facilities above LHS, the golf course in Tilden Regional Park or en route to other destinations along Grizzly Peak Boulevard. Viewers also include recreational users of the Jordan Fire Trail and other trails in the Plan Area.
- Viewer Sensitivity: Viewer sensitivity is considered moderate; while recreational visitors have a high sense of concern for their immediate environment, the presence of research facility structures within the FHR area reduces viewer expectations, and employees of research facilities may have lower sensitivity to visual change. Residents driving past the FHR area would have higher degree of awareness and concern about visual resources in the vicinity of their homes.
- Viewer Exposure: Duration of views varies according to activity. Recreational users would have extended exposure to views of the FHR area, and residents' and employees' exposure would not be extended but would be more frequent as they would drive past the area repeatedly.

Claremont Fire Hazard Reduction

The proposed Claremont FHR is in Claremont Canyon on the north side of Claremont Avenue. Figure 3.2-8 shows the view on Claremont Avenue in the vicinity of Claremont FHR.

- Public Views: Public views of the site are from the perspective of motorists and passengers traveling east or west on Claremont Avenue, or along Grizzly Peak Boulevard, and recreational visitors using the East-West Trail and other trails on the ridge above Claremont Avenue.
- Quality of Views: Views of the FHR area consist of a heavily wooded areas along the Claremont Avenue. Along Grizzly Peak Boulevard there are openings in the vegetation that allow for more distant views of the Bay Area to the west that include foreground and middle ground views of the treatment site. The East-West Trail traverses the north edge of the FHR area and views from this trail include tall stands of eucalyptus and pine trees. Vividness of the views is considered moderately high. The overall visual quality of the treatment site is considered moderately high. Overall, the landscape has few intrusive features, other than the roads, resulting in a moderately high level of intactness. Visual elements within the project site generally maintain a coherent visual pattern, with areas of trees and shrubs blending interspersed with open grassy areas on the hillsides, resulting in a moderate to high level of unity.
- Viewer Groups: Primary viewers are motorists and passengers traveling east and west on Claremont Avenue, on Grizzly Peak Boulevard, and recreational users of Claremont Canyon Regional Preserve lands, including hikers on the East-West Trail, and Side Hill Trail.
- Viewer Sensitivity: Viewer sensitivity is considered high due to extensive recreational use of the trails in the area.
- Viewer Exposure: Viewer exposure would be of short duration for motorists and passengers but would be of long duration for recreational users of the trails.

Source: Ascent Environmental 2020

Figure 3.2-8 View of Claremont Avenue in the Vicinity of Claremont Fire Hazard Reduction Treatment Project Site – P7

Frowning FHR

The proposed Frowning FHR is located along Frowning Ridge along the Upper Jordan Fire Trail. Figure 3.2-9 shows the view of the Upper Jordan Fire Trail adjacent to the Frowning FHR area.

- Public Views: Public views of this FHR area include foreground and middle ground views from Upper Jordan Fire Trail and other trails in the vicinity and from overlook locations along Grizzly Peak Boulevard.
- Quality of Views: Views of FHR area are of mixed vegetative patterns on ridges and in the canyon, including eucalyptus stands, contrasting with distant views of the Bay Area. Vividness is considered moderate to high. Overall the landscape has few intrusive features resulting in a moderately high level of intactness. Visual elements within the FHR area generally maintain coherent visual vegetation patterns, resulting in a moderately high level of unity. The overall visual quality of the treatment site is considered moderately high.
- Viewer Groups: Primary viewers are visitors engaged in recreational activities such as hiking and birdwatching along the Upper Jordan Fire Trail, and motorists on Grizzly Peak Boulevard.
- Viewer Sensitivity: Viewer concern or sensitivity is considered high. Generally, recreationists (visitors and residents of the area) have high concern for the visual environment because it is a major factor in their enjoyment of their surroundings and their activities. The closer the viewer is to the location of the FHR area, the higher the sensitivity. Therefore, those using the Upper Jordan Fire Trail will have the most exposure and the highest sensitivity to visual change.
- Viewer Exposure: The duration of views would vary according to visitor activity. Visitors and residents engaged in recreational activities such as hiking and nature enjoyment on the Plan Area’s trails would have extended duration views.

Source: Ascent Environmental 2020

Figure 3.2-9 View of the Upper Jordan Fire Trail Adjacent to the Frowning Fire Hazard Reduction Treatment Project Site – P8

Scenic Views and Vistas

Long-range panoramic views of the San Francisco Bay and Hill Campus canyons are available from Identified Treatment Project areas including from the Vista parking lot at the Lawrence Hall of Science; from Upper Jordan Fire Trail in the Frowning FHR area; from the East-West Trail near the East-West FB as well as from points along Grizzly Peak Boulevard. Refer to Figure 3.2-4 and Figure 3.2-5. However, dense vegetation along trails and roads block views in many areas.

Existing Light and Glare

Existing lighting sources in the vicinity of the Identified Treatment Project areas are minimal since these treatment areas are largely in undeveloped portions of the Hill Campus. Those treatment sites adjacent to roads would be subject to nighttime lighting and glare, and daytime glare from vehicles.

3.2.2 Regulatory Setting

The regulations identified below are applicable at the program and project level, unless otherwise noted.

FEDERAL

There are no federal plans, policies, regulations, or laws related to aesthetics applicable to the WVFMP.

STATE

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 2020a). Implementation of treatments under the WVFMP would require compliance with this program if treatments would affect vegetation within a state scenic highway.

LOCAL

As a constitutionally created state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies. Therefore, relevant regulations are summarized below.

UC Berkeley 2020 LRDP

The UC Berkeley 2020 LRDP contains the following policy related to aesthetics and visual resources that is applicable to the WVFMP (UC Berkeley 2005 p. 56):

- Maintain the visual primacy of the natural landscape in the Hill Campus

Contra Costa County General Plan

The Open Space Element of the Contra Costa County General Plan contains the following goals and policies related to aesthetics and visual resources that are applicable to the WVFMP (Contra Costa County 2010):

- Open Space Goal 9-A: To preserve and protect the ecological, scenic, cultural/historic, and recreational resource lands of the county.
- Scenic Resources Goal 9-D: To preserve and project areas of identified high scenic value, where practical, and in accordance with the Land Use Element Map.
- Scenic Resources Goal 9-E: To protect major scenic ridges, to the extent practical, from structures, roadways, and other activities which would harm their scenic qualities.
- Scenic Resources Policy 9-13: Providing public facilities for outdoor recreation should remain an important land use objective in the county as a method of promoting high scenic quality, air quality maintenance, and to enhance outdoor recreation opportunities of all residents.
- Scenic Resources Policy 9-20: Hilltops, ridges, rock outcroppings, mature stands of trees, and other natural features shall be considered for preservation, at the time that any development applications are reviewed.

City of Oakland General Plan

The Open Space Conservation and Recreation Element (OSCAR) of the Oakland General Plan includes the following policy relevant to aesthetics and visual quality that is applicable to the WVFMP (City of Oakland 1996):

- OSCAR Policy OS 3.1: Retain open space at Oakland's universities, colleges, and other institutions where such open space provides recreational, aesthetic, conservation, or historic benefits.

The Scenic Highway Element of the City of Oakland Comprehensive Plan (City of Oakland 1974) designates Skyline Boulevard, Grizzly Peak Boulevard and Tunnel Road, which traverse the ridgeline along the eastern edge of Oakland as a scenic route (corridor). The *Specific Policies Related To Skyline Boulevard/Grizzly Peak Boulevard/Tunnel Road* in

Chapter 4 of the Scenic Highway Element, provides the following policies that address aesthetics and visual quality that are relevant to the WVFMP:

- Policy 2: Critical stretches of open space should be left intact, preserving visual continuity within the scenic corridor.
- Policy 3: Grading of land and clearing of vegetation should be kept to an absolute minimum on properties adjacent to the scenic route.
- Policy 8: The removal of large live trees, wherever they occur, should be avoided for desirable species of trees.

3.2.3 Impact Analysis and Mitigation Measures

ANALYSIS METHODOLOGY

The analysis of impacts related to aesthetics and visual resources focuses on the potential for substantial adverse effects to a scenic vista, substantial degradation of scenic resources within a state scenic highway, degradation of existing visual character or quality, and the creation of a new sources of substantial light or glare. The analysis of potential impacts related to aesthetics and visual resources is limited to public views, which are defined as exterior locations accessible by the general public. Accordingly, this analysis considers public views of the Hill Campus from exterior locations, and public views from within the Hill Campus of surrounding areas. Significance determinations account for the influence of relevant EPMs, which are incorporated into treatment design; the full text of EPMs is presented in Section 2.6 "Environmental Protection Measures"

SIGNIFICANCE CRITERIA

An impact on aesthetics and visual resources is considered significant if implementation of the WVFMP would:

- have a substantial adverse effect on a scenic vista;
- substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway;
- in non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings;
- create a new source of substantial light or glare which would adversely affect day or nighttime views in the area.

ISSUES NOT EVALUATED FURTHER

The closest designated state scenic highway is SR 24, which is approximately 0.5 mile south the Plan Area. Views of the Plan Area from SR 24, when available, are extremely limited due to intervening steep topography. SR 24 is on the east side of the ridge, whereas the Plan Area is on the west side of the ridge and heavy vegetation in canyons and ridges further blocks views. Therefore, potential effects of the project on scenic resources within a state scenic highway are not addressed further.

IMPACT ANALYSIS

Impact AES-1: Result in Short-Term, Substantial Degradation of a Scenic Vista or Visual Character or Quality of Public Views from Treatment Activities

Varying degrees of temporary degradation of public views would result during active implementation of vegetation treatment activities under the WVFMP. Herbicide application and managed herbivory would occur intermittently and move throughout a treatment area. These types of activities would not block any views, dominate a viewshed, or significantly disrupt views from a scenic vista. Equipment and vehicles associated with manual and mechanical treatments and prescribed burning as well as smoke from prescribed burning could be visible to public viewers at scenic vistas or other public views. Implementation of EPMs would avoid and minimize visual impacts from the presence of treatment equipment and smoke from prescribed burning. Any temporary degradation of a scenic vista or visual character or quality of the Plan Area would not be substantial; this impact would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects.

Varying degrees of degradation of public views would result during active implementation of vegetation treatment activities under the WVFMP and Identified Treatment Projects, as described below. This impact focuses on the short-term aesthetic effects of each of the treatment activities during active implementation whereas Impact AES-2 below addresses longer-term aesthetic effects of the result of these treatments activities being used in combination to implement a treatment type.

Overall WVFMP (Program-level Analysis)

Manual and Mechanical Vegetation Treatment

During manual and mechanical vegetation treatment activities, hand-held and vehicle-mounted equipment would be used, such as hand tools, chainsaws and other hand-operated power tools and heavy motorized equipment, such as feller-bunchers and masticators, specially designed to cut, tear, uproot, crush, compact, or chop target vegetation. Examples of such equipment in use are shown in Figure 2-4 and Figure 2-5 in Chapter 2, “Project Description.” As described in Chapter 2, UC Berkeley expects to implement manual treatments throughout the year using crews of 6 – 15 personnel working 8 hours per day, dependent upon the type of vegetation being treated. Manual treatments tend to utilize small hand equipment, such as a chainsaw. Because equipment typically used in manual treatment activities tends to be small (refer to Figure 2-4), and much of the Plan Area is heavily forested, manual equipment in use would not be prominently visible from a scenic vista or substantially degrade visual character or quality.

Mechanical treatments use larger equipment than manual treatments (refer to Figure 2-4 in Chapter 2, “Project Description”), but can treat vegetation more efficiently than manual treatments and thus occur over a shorter duration than manual treatments. Although the presence of large mechanical equipment could contrast with the natural environment if visible, the treatment and its visibility would be temporary and would not dominate a view or block any views from scenic vistas or substantially degrade the existing visual character or quality of an area because it would be limited in geographic extent, and mechanical equipment is typically used in areas with large trees, which would at least partially screen views into treatment areas from scenic vistas or other public areas outside of a treatment area. Furthermore, manual and mechanical treatments currently occur within the Plan Area under UC Berkeley’s existing Hill Area Fire Fuel Management Plan; the treatments proposed under the WVFMP would not introduce new or substantially different equipment on the landscape. EPM AES-1 would be implemented during treatment activities to avoid staging equipment within viewsheds of public trails, parks, recreation areas, and roadways to the extent feasible and to minimize the visual presence of treatment-related materials and equipment. Therefore, manual and mechanical treatment activities would not result in a substantial degradation of a scenic vista or of visual character and quality in the Plan Area.

Prescribed Broadcast Burning

As described in Chapter 2, “Project Description,” prescribed broadcast burning typically requires the construction of fire containment lines using manual or mechanical equipment in advance of burning. Workers must be on-site to implement and monitor the burn. Typical equipment used for a prescribed burn would include fire engines, bulldozers and bulldozer transports, masticators or track chippers (to create fuel break perimeter), and a water truck for fire suppression. Prescribed broadcast burning at any one site typically lasts one day and may occur for up to one week and is usually conducted during late spring, or during the fall or winter. Figure 2-6 in Chapter 2, “Project Description,” shows typical prescribed broadcast burning and pile burning operations.

Within forested areas in the Plan Area, it is unlikely that the equipment and vehicles associated with a prescribed broadcast burn would cause significant degradation of a view from a scenic vista, because of the cover provided by trees and the wide ranging and expansive nature of views from scenic vistas. In addition, equipment and vehicles would be only temporarily visible because of the speed of vehicles traveling along a road. In shrub-dominated areas with less tree cover, the equipment associated with prescribed broadcast burning, as well as fire and smoke (addressed below), may be visible from a scenic vista. However, as previously described, views from scenic vistas are expansive and the duration of the view from a passing vehicle along a road would be short; therefore, the presence of equipment and vehicles at a prescribed broadcast burn site would not block any views nor dominate a viewshed. Although their presence could contrast with the existing visual setting and associated visual character and quality of a treatment site, the presence of equipment would be temporary, lasting the duration of a given burn (typically one day). Per EPM AES-1, equipment would be staged outside of viewsheds of public trails, parks, recreation areas, and roadways to the extent feasible. In addition, implementation of EPM AD-2 would require UC Berkeley to update its Facilities Services website and install signage at least one week before disruption or closure of a public roadway or recreation area to notify recreationists so they can avoid the areas of proposed treatments. Although prescribed broadcast burning could temporarily degrade the existing visual character and quality of an area, public viewer exposure could be reduced through notification, affording potential viewers the choice to avoid treatment areas.

Varying levels of smoke would be generated by prescribed broadcast burning, which could affect scenic vistas and other public viewing points by dominating or blocking a view if excessive smoke is generated. An example of past prescribed burns that occurred within the Plan Area are shown in Figure 2-6 in Chapter 2, “Project Description.” Pursuant to EPM AQ-1, UC Berkeley must prepare a burn plan and submit a smoke management plan (SMP) to the Bay Area Air Quality Management District (BAAQMD).The SMP specifies the “smoke prescription,” which is a set of air quality, meteorological, and fuel conditions needed before burn ignition may be allowed, which are developed with the intention of minimizing smoke emissions. Depending on the size and complexity of the burn, the SMP would contain useful information for managing smoke, such as burn monitoring procedures, smoke travel projections (including maps), smoke minimization techniques, and public notification procedures. If conditions ever deviate from the Burn Plan and SMP, (e.g., winds change direction, humidity decreases), the burn is rescheduled, and crews transition from active burning activities to patrolling and extinguishing. Adherence to the Burn Plan and SMP would minimize smoke emissions from prescribed burning. Although smoke emissions could substantially increase if conditions go out of prescription, such increases would be temporary as active burning would cease and crews would begin extinguishing the fire; therefore, smoke would quickly dissipate. Compliance with the SMP and the Burn Plan, as required by EPM AQ-1 would minimize smoke emissions and smoke-related impacts by only allowing prescribed burning to occur when the conditions are appropriate to minimize smoke. Additionally, in accordance with EPM AD-3, UC Berkeley will alert the public to planned prescribed burns and give them adequate notice to reduce the potential for exposure. Furthermore, prescribed broadcast burning would be temporary, lasting up to one week (but typically 1 day) in a discrete area, and any associated smoke emissions would dissipate once burning is complete. Therefore, prescribed broadcast burning would not result in a substantial degradation of a scenic vista or visual character and quality, or substantially damage scenic resources within a state scenic highway.

Managed Herbivory

Managed herbivory would not substantially intrude on views of or within the Plan Area because of the relatively small size of the animals and temporary fencing. An example of managed herbivory in progress is shown in Figure 2-7 in Chapter 2, “Project Description.” Managed herbivory would be used to reduce target plant populations using domestic livestock such as cattle, sheep, or goats. Managed herbivory would be temporary, intermittent, and often be screened from view by vegetation or barely perceptible due to distance from a scenic vista or public viewing point, or temporarily visible because of the speed of passing vehicles along a road. Furthermore, because livestock are a component inherent in natural landscapes, they would not contrast with the visual setting the way equipment and vehicles can. Relative vividness, intactness, and unity of views would remain intact, and thus visual character and quality would remain high. Because managed herbivory would be temporary, intermittent, and utilize livestock (as opposed to large equipment or machinery), it would not result in substantial degradation of a scenic vista, of visual character and quality of public views.

Herbicide Application

Personnel with herbicide application equipment would not substantially intrude on scenic views of the area. The appearance of typical herbicide application treatment activities is shown in Figure 2-8 in Chapter 2, "Project Description." Under the WVFMP, herbicides would only be applied on the ground by manual application devices, and no aerial application would occur. Herbicide application would be temporary, intermittent, and continuously move throughout a treatment area. Herbicide application would often occur within vegetation and thus be largely screened from view. For these reasons, herbicide application itself would not dominate a view or block any views from a scenic vista or public views, nor would it substantially degrade the existing visual character and quality of the treatable landscape. No large or heavy equipment would be used in the hand application of herbicides and UC Berkeley would incorporate EPM AES-1 during implementation of vegetation treatments, which would avoid the staging of equipment within viewsheds of public trails, recreation areas, and roadways to the extent feasible; this would reduce the visual presence of treatment-related materials and equipment. Because herbicide treatment would only use ground-level application, and applicators would be continuously moving throughout a treatment area, visibility in one location would be brief and it would not result in a substantial degradation of a scenic vista, of visual character and quality, or substantially damage scenic resources in the Plan Area.

Although implementation of the WVFMP would increase the number of treatment activities occurring within the Plan Area and thus increase the use of treatment related equipment in the Plan Area, it would not be substantially different than equipment that is currently also occasionally in use within the Plan Area.

Biomass Disposal and Utilization

Biomass disposal and utilization would primarily involve hauling biomass to offsite locations to be incinerated or used in landscaping or existing composting programs, while some would be pile burned or chipped/masticated onsite and incorporated into treated areas. Potential long-term impacts to public views and visual character and quality related to biomass that would be left onsite and incorporated into treatment areas is addressed under Impact AES-2 below.

The majority of biomass (up to 60 percent) is expected to be incinerated using an air curtain burner that would be located at UC Berkeley's Richmond Field Station; all biomass to be incinerated by the air curtain would be hauled to this location. The Richmond Field Station is a self-contained 170-acre property located in a primarily low-density industrial area where large-scale research activities have been occurring for over 50 years and very few if any public views are available. Processing biowaste will not be substantially different aesthetically than other industrial and research activities that presently occur on the site.

Approximately 20 percent of biomass would be chipped or masticated and spread over treatment sites. Equipment used onsite to chip or masticate biomass would be similar in appearance to other mechanical equipment used to remove vegetation and thus the potential short-term impacts are covered under "Manual and Mechanical Vegetation Treatments," above.

Pile burning would be used to dispose of approximately 5 percent of all biomass created under the WVFMP. The potential for short-term degradation of public views because of pile burning would be similar to the short-term impacts described above from prescribed broadcast burning; however, visual impacts would be substantially less due to the small size of burn piles and that they would only take up to one day to complete (refer to Figure 2-6 in Chapter 2, "Project Description"). Therefore, no additional short-term impacts to public views or visual character and quality above and beyond what is described above for prescription burning would occur.

Maintenance and Monitoring

Maintenance and monitoring of treated areas would be implemented to retain the benefits of initial vegetation treatments. Maintenance treatment activities could be different than the original treatment used in the area but would not include any new treatment activities not discussed above (i.e., a site could be initially treated by mechanical treatments only whereas ongoing maintenance may only require manual activities). Therefore, no additional short-term impacts to public views or visual character and quality above and beyond what is described above for the WVFMP treatment activities would occur.

Summary

All of the treatment activities described and evaluated above could be implemented in close proximity to public viewpoints and could be used in various combinations to implement the treatments types (i.e., fire hazard reduction, fuel breaks, evacuation support, temporary refuge areas), which could potentially result in short-term degradation of public views if visible as described above. However, because of the temporary nature of treatment activities, and incorporation of EPMs into treatments implemented under the WVFMP, short-term impacts from treatment activities to scenic vistas, to visual character or quality of public views would be **less than significant**. Long-term effects of the treatment types are evaluated below in Impact AES-2.

Identified Treatment Projects (Project-level Analysis)

As shown in Table 2-3 in Chapter 2, "Project Description," the Identified Treatment Projects would be implemented using different combinations of manual and mechanical treatment activities as well as herbicide use; no prescribed burning or managed herbivory would occur. Although the nature of short-term impacts to scenic vistas and visual character and quality would be the same as described above for the overall WVFMP, more specificity regarding potential views and viewer groups are provided below for the Identified Treatment Projects.

Fire Hazard Reduction Projects

In the Strawberry FHR project area, implementation of the treatment would not affect any scenic vistas, but views of surrounding wooded areas along Centennial Drive and portions of Grizzly Peak Boulevard, and Jordan Fire Trail would be disrupted by treatment activities. Residents in the vicinity of the FHR project area, and recreationists using trails would have moderate to high sensitivity to disruption to visual resources, while motorists would have moderate sensitivity because of shorter duration of views.

In the Claremont FHR project area, implementation of the treatment would not affect any scenic vistas, but views of surrounding wooded areas on the slopes visible from Claremont Avenue and Grizzly Peak Boulevard would be affected by treatment activities. Recreationists using the East-West Trail would have high sensitivity to visual changes, and motorists traveling on the roadways would have moderate sensitivity to visual change. Figure 3.2-8 shows the view on Claremont Avenue in the vicinity of Claremont FHR project area.

In the Frowning FHR project area, treatment activities may be visible in scenic vistas of the San Francisco Bay as viewed from scenic overlooks along Grizzly Peak Boulevard and from points along the Upper Jordan Fire Trail. Figure 3.2-9 shows the view of the Upper Jordan Fire Trail adjacent to the Frowning FHR project area. Surrounding vegetated areas on the slopes visible from Upper Jordan Fire Trail and connecting trails would be affected by treatment activities. Recreationists using the hiking trails and sightseers at scenic overlooks on Grizzly Peak Boulevard with extended duration of views would have high sensitivity to visual changes. However, the Upper Jordan Fire Trail would be closed during treatment activities, limiting recreationists' views of the treatment activities.

Manual and mechanical treatments similar to what would be required to implement the fire hazard reduction projects currently occur within the Plan Area under UC Berkeley's existing Hill Area Fire Fuel Management Plan; the treatments proposed under the WVFMP would not introduce new or substantially different equipment or activities on the landscape. EPM AES-1 would be implemented during treatment activities to avoid staging equipment within viewsheds of public trails, parks, recreation areas, and roadways to the extent feasible and to minimize the visual presence of treatment-related materials and equipment. Because herbicide treatment would only use ground-level application, and applicators would be continuously moving throughout a project area, visibility in one location would be brief and it would not result in a substantial degradation of a scenic vista, of visual character and quality, or substantially damage scenic resources in the treatment sites.

Temporary Refuge Area Projects

Primary viewers of TRA 1 would be motorists traveling along Claremont Avenue and recreationists using trails within Claremont Canyon Regional Preserve. There are no scenic vistas within or near the proposed treatment site. Motorists are moderately sensitive to visual change due to the short duration of their views whereas recreationists have high sensitivity to visual change. Figure 3.2-6 shows the view east along Claremont Avenue at Milepost 29 in the vicinity of TRA 1. As shown, views include a meadow opening and a heavily wooded area along the road and bordering the meadow.

TRAs 2 and 3 are both located on the Upper Jordan Fire Trail and the primary viewer groups are recreationists using that trail and the nearby East-West Trail on Claremont Ridge, who would have extended duration of views. Figure 3.2-7 shows a panoramic view from Upper Jordan Fire Trail in the vicinity of TRA 2. Viewer sensitivity is considered high. Scenic views of TRA 2 on Upper Jordan Fire Trail include Strawberry Canyon and Frowning Ridge, and scenic vistas of the Bay Area are visible from the East-West Trail. TRA 3 is visible from intersecting trails and from Jordan Fire Trail. Surrounding vegetation largely blocks distant views from the treatment site. Viewer sensitivity for trail users is considered high. However, the Upper Jordan Fire Trail would be closed during treatment activities, limiting recreationists' views of the treatment activities.

Treatment activities used to install temporary refuge areas would consist of manual and mechanical vegetation removal, followed by herbicide application. As described above for FHR projects, these types of treatment activities currently occur within the Plan Area under UC Berkeley's existing Hill Area Fire Fuel Management Plan; the treatments proposed under the WVFMP would not introduce new or substantially different equipment or activities on the landscape. EPM AES-1 would be implemented during treatment activities to avoid staging equipment within viewsheds of public trails, parks, recreation areas, and roadways to the extent feasible and to minimize the visual presence of treatment-related materials and equipment. Because herbicide treatment would only use ground-level application, and applicators would be continuously moving throughout a project area, visibility in one location would be brief and it would not result in a substantial degradation of a scenic vista, of visual character and quality, or substantially damage scenic resources in the treatment sites.

Fuel Break Projects

The Hearst Gate FB would be implemented using entirely small hand-held equipment and could be visible from UC Berkeley parking areas located on the east and west sides of the fuel break, to motorists traveling along Cyclotron Road, or to recreationists using a trail south of the fuel break. Only recreationists would have high sensitivity and extended exposure to views with equipment; manual equipment is unobtrusive, the treatment area is limited (1.2 acres) and treatment activities would take no more than 4 weeks to complete, Treatment activities would be visually similar to other vegetation treatments and landscaping activities already occurring in the Plan Area.

The proposed East-West FB would involve manual and mechanical vegetation removal, followed with by the use of herbicides. Effects on to visual resources would be similar to those described for these treatment activities in the overall WVFMP discussion above.

Public views of this treatment site include limited views from residential streets south of the Plan Area on Alvarado Ridge and from Grizzly Peak Boulevard; and foreground views from the East-West Trail and other trails in the vicinity of Grizzly Peak Boulevard. The ridge top is not visible from Claremont Avenue due to terrain and dense vegetation on the hill side above road. The treatment site may be partially visible from overlook locations along Grizzly Peak Boulevard, which provide scenic panoramic views of Bay Area that include the San Francisco Bay, the City of San Francisco, the Golden Gate, and Marin Headlands. Primary viewers are recreationists using the East-West Trail and other trails in the immediate vicinity. Viewer sensitivity for recreationists is considered high.

EPM AES-1 would be implemented during treatment activities to avoid staging equipment within viewsheds of public trails, parks, recreation areas, and roadways to the extent feasible and to minimize the visual presence of treatment-related materials and equipment. Trails in the immediate vicinity of the treatment sites would be closed during treatment activities, limiting exposure of recreationists to views of the fuel break treatment activities and equipment. The work would progress along the length of the fuel break and would last up to 8 weeks. Treatment activities would be visually similar to other vegetation treatments and landscaping activities already occurring in the Plan Area.

Biomass Disposal and Utilization

Biomass disposal and utilization for the Identified Treatment Projects would be same as described above for the WVFMP, except no pile burning would occur. Therefore, no short-term, substantial degradation of public views or of visual character or quality would result from biomass disposal or utilization related to the Identified Treatment Projects.

Maintenance and Monitoring

Maintenance and monitoring of Identified Treatment Project areas would be the same as described above for the WVFMP and no new treatment activities would be used. Therefore, no additional short-term impacts to public views or visual character and quality above and beyond what is described above for the Identified Treatment Projects would occur.

Summary

Manual and mechanical treatments as well as herbicide use for the Identified Treatment Project would be implemented in close proximity to public viewpoints and could result in short-term degradation of public views. However, because treatment types and activities are visually similar to other vegetation treatments and landscaping activities already occurring in the Plan Area, and EPMs would be integrated into treatment design to avoid and minimize aesthetic impacts and reduce viewer exposure, short-term degradation would not be substantial. Impacts from the proposed Identified Treatment Projects to scenic vistas, to visual character or quality of public views, would be **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

Impact AES-2: Result in Long-Term, Substantial Degradation of a Scenic Vista or Visual Character or Quality of Public Views from Implementation of the Treatment Types

Implementation of the proposed vegetation treatment types under the overall WVFMP and the Identified Treatment Projects would result in the removal of trees and other vegetation, and in many cases, eucalyptus trees, which may be considered a visual resource by some viewers. In addition, creation of temporary refuge areas and non-shaded fuel breaks would require the removal of all trees and understory plants, which would create areas of noticeable contrast between the cleared areas and surrounding vegetation and substantially degrade public views. Furthermore, vegetation removal required to implement the vegetation treatment types would need to be maintained; therefore, substantial adverse changes to visual resources and visual character and quality of public views would occur. This impact would be **significant** for the overall WVFMP as well as the Identified Treatment Projects.

Overall WVFMP (Program-level Analysis)

Evacuation Support Treatment

As described in Section 2.4 of Chapter 2, "Project Description," ESTs are currently implemented in the Plan Area and focus on removing (including pruning) all trees prone to torching up to 100 feet from either side of major evacuation routes that could potentially block access if they fall. The secondary focus of vegetation treatments is to remove understory shrubs and small trees that could enable torching within 100 feet on either side of evacuation routes. ESTs under the WVFMP would be the same as those currently implemented, except that the buffer for ESTs could increase to up to 200 feet on either side of evacuation routes, and prescribed broadcast burning could be used for implementation or follow-up treatments.

Given that ESTs would be implemented adjacent to existing roadways where there is already a break in vegetation, and because not all vegetation would be removed to implement this treatment type, it is unlikely that ESTs would be visible from scenic vistas such that views would be substantially degraded. As shown in Figure 3.2-4 and Figure 3.2-5, ESTs would not be discernible from scenic vistas because of the variety and density of vegetation that is visible. ESTs could degrade the visual character or quality of views by the public in the immediate area where they are implemented, such as motorists traveling along evacuation routes or recreationists using trails in the Plan Area, which have moderate and high sensitivity to visual change, respectively. Although small trees and other vegetation would remain in treated areas, there would be overall less vegetation present, which could reduce the visual intactness and unity of views. In addition, implementation of ESTs would remove trees regardless of species and could result in the removal of eucalyptus trees, which may be considered a visual resource to some viewers.

If prescribed broadcast burning is used to implement or maintain an EST, it would temporarily change the color of the treatment area from green or brown (depending on the vegetation present and the time of year) to a dark gray/black, which could result in a short term and temporary adverse change in the visual character or quality of the area. Although this visual change would be temporary, because it would change the composition of vegetation and color of the landscape to dark gray/black, it would degrade the visual character or quality of public views of the treatment until successional vegetation reestablishes.

Fire Hazard Reduction

Fire hazard reduction treatments could be implemented through various combinations of any of the treatment activities proposed under the WVFMP including manually and mechanically removing high fire hazard vegetation and trees using hand tools, feller-bunchers, or a grapple saw. To prevent resprouting, an herbicide would be applied by a licensed applicator to some tree stumps immediately following removal.

The focus of WVFMP fire hazard reduction treatments is to reduce fuel loads and slow or prevent the spread of fire between wildlands and structures and vice versa and would be primarily implemented in areas where eucalyptus trees were previously removed but regrowth occurred because of ineffective follow-up treatments. Also, where existing habitat within the Hill Campus is degraded, such as by the infestation of non-native plant species (which poses a wildfire risk), treatments would also enhance habitat quality. As shown in Figures 3.2-2, 3.2-3, and 3.2-4, views of the Plan Area as seen from a scenic vista or other public viewing point can vary widely with the contrast between wildland vegetation, and buildings, roads, and other contrasting elements. The FHR treatment areas may not be discernable in scenic vistas and in public views given the variety of vegetative colors, forms, shapes, patterns and topography of the Hill Campus. However, given the viewer sensitivity and overall exposure in the Plan Area, there could be an adverse visual impact to the existing visual character and quality of views from roads that traverse the Hill Campus, and from hiking trails that are within and near treatment areas. The landscape would be only temporarily visible from roads due to vehicle speeds but would be visible for extended periods for recreationists using trails. Although large trees and other vegetation would remain in FHR treatment areas, less vegetation would be present where these treatments occur and additional eucalyptus trees may be removed; consequently, public views could be degraded. In addition, if prescribed broadcast burning is used to implement or maintain a FHR treatment, the area would become dark gray/black until successional vegetation reestablishes, which would also temporarily degrade the visual character and quality of public views.

Fuel Breaks

Fuel breaks are strategically located linear strips where vegetation has been treated or removed to aid in the containment of a fire and reduce the likelihood of crown fire transition. Shaded fuel breaks are typically used in forest settings and the tree canopy is thinned to reduce the potential for a crown fire to move through the canopy and larger trees are left in place. To implement non-shaded fuel break treatments under the WVFMP, all tree and shrub vegetation in the fuel break area would be removed. Figure 2-3 in Chapter 2, "Project Description," shows an example of a shaded and a non-shaded fuel break. Shaded and non-shaded fuel breaks would be up to 200 feet wide under the WVFMP and could be visible from several vantage points including from a scenic vista, roads, recreation trails, or from other public viewing points. As shown in Figure 2-3, non-shaded fuel breaks in particular can change the landscape by introducing a contrasting linear element in an otherwise natural environment, which reduces vividness, intactness, and unity, and both types of fuel breaks could result in the removal of eucalyptus trees. In addition, if prescribed broadcast burning is used to implement or maintain a fuel break, the area within the fuel break would become dark gray/black until successional vegetation reestablishes. These adverse changes could constitute substantial degradation of visual character and quality, which could be visible from a scenic vista, trails, or from other public viewing points in the Plan Area.

Temporary Refuge Areas

Temporary refuge areas would be created near the intersections of roads and fire trails by removing all trees and shrubs in an approximately 200-foot diameter area from the edge of pavement or fire trail. Other than low profile and regularly mowed grass, all other vegetation would be removed. Although they may not be visible from scenic vistas due to their small size, because all vegetation would be removed and they would be located near public areas, they could be visible to passing motorists and/or recreationists. Recreational viewers tend to have moderate to high exposure and are highly sensitivity to visual changes. In heavily vegetated and wooded areas, removal of all trees and understory plants would create areas of noticeable contrast between the cleared refuge areas and surrounding vegetation, which would decrease the unity and intactness of views. In addition, if prescribed broadcast burning is used to implement or maintain temporary refuge areas, the area within the fuel break would become dark gray/black until successional vegetation reestablishes. Therefore, implementation of temporary refuge areas could substantially degrade visual character and quality and public views of areas where they are established.

Biomass Disposal

Biomass disposal and utilization would primarily involve hauling biomass to offsite locations to be incinerated or used in landscaping or existing composting programs, while a small portion would be pile burned or chipped/masticated onsite and incorporated into treated areas. The visual effects of pile burning would be short-term and are addressed in the discussion of prescribed broadcast burning under Impact AES-1 above. Biomass that is hauled offsite would either not be publicly visible (e.g., Richmond Field Station), or incorporated into landscaping. Approximately 20 percent of biomass would be chipped or masticated and spread over treatment sites. The potential impacts to visual character and quality are similar to those described above for the WVFMP treatment types and public views of these areas would likely be substantially degraded.

Maintenance and Monitoring

Long term maintenance and monitoring would maintain the initial treatments, which are more fully addressed above. Maintenance treatments could be different than the original treatment, such as a manual treatment using chainsaws to create shaded fuel breaks along roads followed by periodic managed herbivory or prescribed broadcast burning to keep sprouting and fuel loads low. Vegetation treatment activities would primarily consist of herbicide use, and manual and mechanical treatments. UC Berkeley anticipates that fuel breaks would need to be maintained every 3 to 7 years depending on shrub growth; evacuation support treatments are expected to be maintained the following year, and then every 5-7 years thereafter; fire hazard reduction treatments are expected to be maintained every 5 years, based on fuel volume and potential ember production and distribution. No additional impacts to public views or visual character and quality above and beyond what are described above for the WVFMP treatment types would occur during maintenance and monitoring.

Summary

Implementation of the proposed treatment types would require the removal of trees or other vegetation, which would alter the landscape and potentially remove eucalyptus trees, which have a strong visual identity and may be considered a visual resource to some viewers. In addition, prescribed broadcast burning could be used to implement or maintain any of the treatment types. The burned area would become dark gray/black, which would temporarily degrade the visual character and quality of public views until successional vegetation reestablishes. For these reasons, and because vegetation removal under the WVFMP would need to be maintained, adverse changes to visual resources and visual character and quality from implementation of the proposed treatment types would be **significant**.

Identified Treatment Projects (Project-level Analysis)

Fire Hazard Reduction Projects

The Strawberry FHR project would be implemented on approximately 24 acres in the northwesternmost part of the Plan Area. The treatment site would be visible to motorists along Centennial Drive and portions of Grizzly Peak Boulevard, and to recreationists using the Jordan Fire Trail.

The Claremont FHR treatment site would be visible to motorists on Claremont Avenue and Grizzly Peak Boulevard. Recreationists using the East-West Trail would have high sensitivity to visual changes, and motorists traveling on the roadways would have moderate sensitivity to visual change.

The Frowning FHR treatment site would be visible in scenic vistas of the San Francisco Bay as viewed from scenic overlooks along Grizzly Peak Boulevard and from points along the Upper Jordan Fire Trail.

Of all the treatment types implemented for the Identified Treatment Projects, the FHR projects would retain most visually dominant vegetation. Along the Upper Jordan Fire Trail, scenic and long-range views would be improved by the thinning of dense vegetation. However, less vegetation would be present where these treatments occur, and eucalyptus trees exist in all three FHR project areas that would likely be removed. Because vegetation removal would be long-term and visible to recreationists with high sensitivity to visual change, the visual character and quality of public views would be degraded.

Fuel Breaks

The Hearst Gate FB would be a shaded fuel break that would only remove understory vegetation and select trees, likely including some eucalyptus trees, in an area up to approximately 559 feet in length and 93 feet wide. The fuel break site would be visible from UC Berkeley parking areas located on the east and west sides of the fuel break, to motorists traveling along Cyclotron Road, or to recreationists using a trail south of the fuel break.

Implementation of the East – West FB would require removal of all trees and vegetation, including areas of eucalyptus trees, along its length of approximately 1.4 miles and width of 126 feet. Given its large size and that all vegetation would be removed, the fuel break would be visible from several vantage points, including the East-West Trail, scenic vistas on Grizzly Peak Boulevard, portions of the Upper Jordan Fire Trail, and local residential roadways. Primary viewer groups with views of the East – West FB would include recreationists and motorists.

Implementation of these proposed fuel breaks would result in vegetation removal, including the removal of eucalyptus trees, and would be visible to recreationists with high sensitivity to visual change. In addition, the East – West FB would create a contrasting linear element in an otherwise natural environment by removing all vegetation in its footprint, which could reduce vividness, intactness, and unity of public views. Implementation of the fuel breaks would result in a substantial degradation of visual character and quality of public views.

Temporary Refuge Areas

TRA 1 on Claremont Avenue would be visible to motorists, who would have direct line of sight but short duration view of the TRA site. TRAs 2 and 3 are both located on the Upper Jordan Fire Trail and would partially overlap with existing graded trails and fire roads. Although the TRAs would be small relative to the surrounding vegetated areas, they would remove all trees and shrubs, including some areas of eucalyptus trees, and would be visible to public viewers such as motorists and recreationists. Therefore, implementation of the TRAs would result in a substantial degradation of visual character and quality of public views.

Biomass Disposal and Utilization

Biomass disposal and utilization for the Identified Treatment Projects would be the same as described above for the WVFMP, except no piling burning would occur. The majority of biomass would be hauled to the offsite locations described above (e.g., Richmond Field Station), while some would be incorporated into treatment areas as logs or chips. No additional impacts to public views or visual character and quality above and beyond what are described above for each of the projects would occur.

Maintenance and Monitoring

These activities would maintain the initial treatment, impacts that are covered above under the overall WVFMP. Vegetation treatment activities would primarily consist of herbicide use, and manual and mechanical treatments. No additional impacts to public views or visual character and quality above and beyond what are described above for each of the Identified Treatment Projects would occur.

Summary

Implementation of each of the Identified Treatment Projects would remove trees and vegetation, including eucalyptus trees, which would alter the landscape and reduce vividness, intactness, and unity of public views. These visual changes would constitute a substantial degradation of visual character and quality, and this impact would be **significant.**

Mitigation Measures

Mitigation Measure AES-2: Conduct Visual Reconnaissance for Prior to Implementing All Treatment Types, and Relocate or Feather and Screen Publicly Visible Treatment Areas

UC Berkeley will conduct a visual reconnaissance of the treatment area before establishing ESTs, FHRs, FBs, and TRAs to observe the surrounding landscape and determine if public viewing locations, including scenic vistas, public trails, and state scenic highways, have views of the proposed treatment area. If none are identified, the treatment may be implemented without additional visual mitigation.

If UC Berkeley identifies public viewing points, including heavily used scenic vistas, public trails, recreation areas, with lengthy views (i.e., longer than a few seconds) of a proposed treatment area, UC Berkeley will, before implementation, identify any change in location of the treatment site to reduce its visibility from public viewpoints. If no changes exist that would reduce impacts to public viewers and achieve the intended wildfire risk reduction objectives of the proposed treatment, UC Berkeley will thin and feather adjacent vegetation to break up the linear edges of treatment areas and strategically preserve vegetation at the edge of the treatment area, to help screen public views and minimize the contrast between the treatment area and surrounding vegetation.

<u>Significance after Mitigation</u>

Overall WVFMP

Because of the strategic nature of siting treatment projects, it may be infeasible to relocate a treatment to avoid public visibility while still providing for effective fire fuel reduction. Further, relocating a treatment may not achieve the wildfire risk reduction objectives of the treatment and vegetation feathering techniques may not fully and effectively mitigate the adverse visual impact to public viewers. Therefore, if Mitigation Measure AES-2 is necessary to reduce a significant impact and cannot be implemented in a way that would feasibly reduce the visual impact below significance, a substantial degradation of a scenic vista or visual character or quality of public views from the treatment types under the WVFMP could be unavoidable. Accordingly, the impact would remain **significant and unavoidable**.

Identified Treatment Projects

Based on visual reconnaissance, it was determined that public viewing locations, including scenic vistas and public trails, have views of the proposed Identified Treatment Projects. However, because of the strategic nature of siting the treatments, it is not feasible to relocate the Identified Treatment Projects to avoid public visibility while achieving the wildfire risk reduction objectives. UC Berkeley will implement vegetation feathering techniques to reduce the visibility of the Identified Treatment Projects, but substantial degradation of a scenic vista or visual character or quality of public views would still occur despite mitigation. Therefore, with implementation of Mitigation Measure AES-2 this impact would remain **significant and unavoidable**.

Impact AES-3: Create a New Source of Substantial Light or Glare, Which Would Adversely Affect Day or Nighttime Views of the Area

Because the Plan Area is largely undeveloped, exposure of the public to nighttime light or glare as a result of vegetation removal would be unlikely because it would require complete vegetation removal in locations where there are sensitive viewers and existing sources of substantial nighttime light or glare. Many treatment types would thin vegetation as opposed to completely removing it within a discrete area. Additionally, all lights on the university campus must comply with Title 24 California Code of Regulations, Part 6 (California Energy Code, or the Energy Standards) that would minimize light spillage and minimize atmospheric light pollution. Therefore, implementation of the WVFMP would not create a new source of substantial light or glare, and vegetation removal under the WVFMP would not expose the public to substantial existing sources of light or glare, which would adversely affect day or nighttime views on the area. This impact would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects.

Overall WVFMP (Program-level Analysis)

In the short-term, during active implementation of treatment activities, intermittent daytime glare could be produced by reflections off vehicles and equipment. When vehicles and equipment are located near public roads or trails, glare could be seen by motorists or trail users in the vicinity of treatment operations. Glare from equipment and vehicles in treatment areas would not be substantial because it would be short-term, occurring only when a viewer passes from a specific vantage point, and would be minimized in many cases by intervening vegetation. As described in Chapter 2, "Project Description," treatments would be implemented between 8:00 a.m. and 6:00 p.m.; therefore, no nighttime lighting would be used under the WVFMP.

Implementation of the WVFMP would not result in any new sources of light or glare. However, treatment types that would remove most or all vegetation in a treatment area (i.e., non-shaded fuel breaks and possibly temporary refuge areas) that occur between sources of existing light or glare and public views of the area could result in increased nighttime light or glare experienced by those viewers. Because the Plan Area is largely undeveloped, exposure of the public to nighttime light or glare as a result of vegetation removal would be rare. It would be unlikely for treatments that involve complete vegetation removal to take place in locations where there are sensitive viewers and existing sources of substantial nighttime light or glare. Further, many treatment types would thin vegetation as opposed to completely remove it. Additionally, lighting on the university campus must comply with Title 24 California Code of Regulations, Part 6 (California Energy Code, or the Energy Standards) for shielding and cutoffs that minimize light spillage and minimize atmospheric light pollution. Therefore, implementation of the WVFMP would not create a new source of substantial light or glare, and vegetation removal under the WVFMP would not expose the public to substantial existing sources of light or glare, which would adversely affect day or nighttime views on the area. This impact would be **less than significant.**

Identified Treatment Projects (Project-level Analysis)

As described above, in the short-term, during active implementation of treatment activities, intermittent daytime glare could be produced by reflections off vehicles and equipment and could be visible when occurring near public roads or trails. Glare from equipment and vehicles in treatment areas would not be substantial because it would be short-term, occurring only when a viewer passes a specific vantage point, and would be minimized in many cases by intervening vegetation.

Exposure of adjacent properties and public views to existing sources of light could occur from implementation of treatment types that would result in complete or almost complete removal of vegetation (i.e., non-shaded fuel breaks and possibly temporary refuge areas). None of the proposed non-shaded fuel breaks or temporary refuge area projects would be located in areas where there is existing nighttime lighting and none are located adjacent to residential or other areas where light spillover would be of concern.

The Identified Treatment Project that is closest to existing land uses that could be sensitive to spillover light or glare from nighttime lighting after proposed removal of vegetation is the Strawberry Fire Hazard Reduction Project. This treatment site is in the northwesternmost part of the Plan Area and a portion of the site is adjacent to a residential area. The treatment would selectively thin vegetation that is between research facility buildings with exterior security lighting and lighted parking lots and the residential area, which is located approximately 500 feet from research facility buildings. The lighting source is not immediately adjacent to the residential area, and the treatment would retain large trees on the site. Additionally, the university must comply with the Title 24 California Code of Regulations, Part 6 (California Energy Code, or the Energy Standards) as described above. Therefore, the identified treatment projects would not result in exposing the public to substantial existing sources of light or glare, which would adversely affect day or nighttime views of the area. This impact would be **less than significant.**

Mitigation Measures

No mitigation is required for this impact.

3.3 AIR QUALITY

This section includes a discussion of existing air quality conditions, a summary of applicable federal, state, and local regulations, and evaluation of the potential for air quality impacts caused by implementation of the WVFMP, including the Identified Treatment Projects, within the Plan Area.

Comments on the Notice of Preparation (NOP) related to air quality included concerns regarding emissions generated by the use of heavy equipment, as well as the potential of this machinery to ignite a fire; the generation of toxic fumes when vegetation treated with herbicides is burned; the effects of odors on receptors with heightened sensitivity to chemicals; and the requirements that prescribed burning be conducted in accordance with Bay Area Air Quality Management District (BAAQMD) Regulation 5 (Open Burning) as well as in compliance with Smoke Management Plans (SMPs) approved by the BAAQMD Air Pollution Control Officer (APCO).

The potential air quality emissions from machinery used to perform treatments are addressed under Impact AQ-1, and the potential for wildfire ignition resulting from equipment use is addressed in Section 3.12, "Wildfire." The emissions of toxic air contaminants (TACs) from burning vegetation that has previously been treated with herbicides is addressed under Impact AQ-2. The exposure of sensitive receptors to odorous exhaust emissions from heavy equipment and other power tools is evaluated under Impact AQ-4. The exposure of sensitive receptors to odorous smoke generated by prescribed burns is evaluated under Impact AQ-5. Specific environmental protection measures (EPMs) that would be incorporated into all prescribed burns, including preparation of a burn plan and submittal of a SMP to BAAQMD in accordance with Regulation 5, are described in Section 2.6 "Environmental Protection Measures."

3.3.1 Environmental Setting

The Plan Area is primarily in Alameda County with a small portion in Contra Costa County, and is wholly encompassed within the San Francisco Bay Area Air Basin (SFBAAB). The SFBAAB also includes Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara Counties; the southwest portion of Solano County; and the southern portion of Sonoma County. The ambient concentrations of air pollutant emissions are determined by the amount of emissions released by the sources of air pollutants and the atmosphere's ability to transport and dilute such emissions. Natural factors that affect transport and dilution include terrain, wind, atmospheric stability, and sunlight. Existing air quality conditions in the area are determined by such natural factors as topography, meteorology, and climate, in addition to the quantity of emissions released by existing air pollutant sources, as discussed separately below.

CLIMATE, METEOROLOGY, AND TOPOGRAPHY

Atmospheric conditions such as wind speed, wind direction, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. The climate of the Bay Area is determined largely by a high-pressure system that is often present over the eastern Pacific Ocean. High-pressure systems are characterized by an upper layer of dry air that warms as it descends, restricting the mobility of cooler marine-influenced air near the ground surface, resulting in subsidence inversions. During summer and fall, locally generated emissions can, under the restraining influences of topography and subsidence inversions, cause conditions that are conducive to the formation of photochemical pollutants, such as ozone and secondary particulates (e.g., nitrates and sulfates). In the winter, the Pacific high-pressure system shifts southward, allowing storms to pass through the area (BAAQMD 2017a).

Along the western side of the coastal range in Alameda and Contra Costa Counties, including the Plan Area, temperatures are moderated by San Francisco Bay, which acts as a heat source during cold weather, and as a heat sink, due to evaporative cooling, during warm weather.

Average summer temperatures are typically mild overnight and warm during the day, with cooler temperatures and stronger winds more common along the western coast. Wind speeds are generally low throughout the region and winds typically blow from northwest to southeast. However, strong afternoon gusts sometimes occur along the coast, aided by the dominant westerly winds. Annual rainfall averages between 14 and 23 inches across Alameda County and are highest in the northern portion of Alameda County, especially in the Oakland-Berkeley hills (BAAQMD 2019a). Similar precipitation levels also exist in Contra Costa County.

CRITERIA AIR POLLUTANTS

Concentrations of criteria air pollutants are used to indicate the quality of ambient air in the SFBAAB. A brief description of key criteria air pollutants in the SFBAAB is provided below. Emission source types and health effects are summarized in Table 3.3-1. Monitoring data applicable to the Plan Area are provided in Table 3.3-2. The attainment statuses in the SFBAAB with respect to the California Ambient Air Quality Standards (CAAQS) and the National Ambient Air Quality Standards (NAAQS) are shown in Table 3.3-3.

Ozone

Ozone is a photochemical oxidant (a substance whose oxygen combines chemically with another substance in the presence of sunlight) and the primary component of smog. Ozone is not directly emitted into the air but is formed through complex chemical reactions between precursor emissions of reactive organic gases (ROG) and oxides of nitrogen (NO_X) in the presence of sunlight (EPA 2019). ROG are volatile organic compounds that are photochemically reactive. ROG emissions result primarily from incomplete combustion and the evaporation of chemical solvents and fuels. NO_X are a group of gaseous compounds of nitrogen and oxygen that result from the combustion of fuels.

Acute health effects of ozone exposure include increased respiratory and pulmonary resistance, cough, pain, shortness of breath, and lung inflammation. Chronic health effects include permeability of respiratory epithelia and possibility of permanent lung impairment (EPA 2019). Emissions of the ozone precursors ROG and NO_X have decreased over the past two decades because of more stringent motor vehicle standards and cleaner burning fuels (CARB 2013).

Nitrogen Dioxide

Nitrogen dioxide (NO_2) is a brownish, highly reactive gas that is present in all urban environments. The major human-made sources of NO_2 are combustion devices, such as boilers, gas turbines, and mobile and stationary reciprocating internal combustion engines. Combustion devices emit primarily nitric oxide (NO), which reacts through oxidation in the atmosphere to form NO_2. The combined emissions of NO and NO_2 are referred to as NO_X and are reported as equivalent NO_2. Because NO_2 is formed and depleted by reactions associated with photochemical smog (ozone), the NO_2 concentration in a particular geographical area may not be representative of the local sources of NO_X emissions (EPA 2012).

Acute health effects of exposure to NO_X includes coughing, difficulty breathing, vomiting, headache, eye irritation, chemical pneumonitis, or pulmonary edema, breathing abnormalities, cough, cyanosis, chest pain, rapid heartbeat, and death. Chronic health effects include chronic bronchitis and decreased lung function (EPA 2019).

Particulate Matter

Respirable particulate matter with an aerodynamic diameter of 10 micrometers or less is referred to as PM_{10}. PM_{10} consists of particulate matter emitted directly into the air, such as fugitive dust, soot, and smoke from mobile and stationary sources, construction operations, fires and natural windblown dust, and particulate matter formed in the atmosphere by reaction of gaseous precursors (CARB 2013; EPA 2019). Fine particulate matter ($PM_{2.5}$) includes a subgroup of smaller particles that have an aerodynamic diameter of 2.5 micrometers or less. PM_{10} emissions in the SFBAAB are dominated by emissions from area sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, farming operations, construction and demolition, and particles from residential fuel combustion. Direct emissions of PM_{10} are projected to remain relatively constant through 2035. Direct emissions of PM_{10} have increased slightly over the last 20 years and are projected to continue to increase slightly through 2035. Ambient $PM_{2.5}$ emissions have remained relatively steady over the last 20 years and are projected to decrease slightly through 2035 (CARB 2013).

Table 3.3-1 Sources and Health Effects of Criteria Air Pollutants

Criteria Pollutant	Sources	Acute[1] Health Effects	Chronic[2] Health Effects
Ozone	Secondary pollutant resulting from reaction of NO_X and ROG in presence of sunlight. ROG emissions result from incomplete combustion and evaporation of chemical solvents and fuels; NO_X results from the combustion of fuels	increased respiration and pulmonary resistance; cough, pain, shortness of breath, lung inflammation	permeability of respiratory epithelia, possibility of permanent lung impairment
Carbon monoxide (CO)	Incomplete combustion of fuels; motor vehicle exhaust	headache, dizziness, fatigue, nausea, vomiting, death	permanent heart and brain damage
Nitrogen dioxide (NO_2)	combustion devices, e.g., boilers, gas turbines, and mobile and stationary reciprocating internal combustion engines	coughing, difficulty breathing, vomiting, headache, eye irritation, chemical pneumonitis or pulmonary edema; breathing abnormalities, cough, cyanosis, chest pain, rapid heartbeat, death	chronic bronchitis, decreased lung function
Sulfur dioxide (SO_2)	coal and oil combustion, steel mills, refineries, and pulp and paper mills	Irritation of upper respiratory tract, increased asthma symptoms	Insufficient evidence linking SO_2 exposure to chronic health impacts
Respirable particulate matter (PM_{10}), Fine particulate matter ($PM_{2.5}$)	fugitive dust, soot, smoke, mobile and stationary sources, construction, fires and natural windblown dust, and formation in the atmosphere by condensation and/or transformation of SO_2 and ROG	breathing and respiratory symptoms, aggravation of existing respiratory and cardiovascular diseases, premature death	alterations to the immune system, carcinogenesis
Lead	metal processing	reproductive/ developmental effects (fetuses and children)	numerous effects including neurological, endocrine, and cardiovascular effects

1 "Acute" refers to effects of short-term exposures to criteria air pollutants, usually at fairly high concentrations.

2 "Chronic" refers to effects of long-term exposures to criteria air pollutants, usually at lower, ambient concentrations.

Notes: NO_X = oxides of nitrogen; ROG = reactive organic gases.

Sources: EPA 2019

Ultrafine Particulate Matter

More recently, ultrafine particulate matter (UFP) has become a topic of greater concern. UFP refers to a subfraction of currently regulated $PM_{2.5}$ and PM_{10} size particles. UFP is most often defined as particles with an aerodynamic diameter of 0.1 microns or smaller. Although UFP consists of only a small fraction of the total mass of PM emissions, UFP supports a large surface and is often heavily concentrated. Because of its small size, a given mass of UFP contains thousands to tens of thousands more particles. Moreover, also because of its size, UFP is highly penetrative to human tissues as compared to PM_{10} and $PM_{2.5}$ and can easily pass from the alveoli of the lungs into the bloodstream. UFP are also more easily able to cross the blood-brain barrier and exert neurotoxic effects. Observed human health effects in selected studies include lung function changes, airway inflammation, enhanced allergic responses, vascular thrombogenic effects, altered endothelial function, altered heart rate and heart rate variability, accelerated atherosclerosis, and increased markers of brain inflammation (Health Effects Institute 2013:3, 36, 39, 45, and 65). The predominant source of UFP is combustion by on-road vehicles, off-road vehicles, stationary sources, and vegetation burning (Health Effects Institute 2013:1, CARB 2006:3, Kleeman et al. 2007:1, and Black et al. 2017a).

Criteria Air Pollutant Emissions from Wildfires and Prescribed Burns

Wildfires and prescribed burns produce smoke, which is composed of a complex mixture of CO_2, water vapor, CO, particulate matter, ROG and other organic chemicals, NO_X, and trace minerals. There are thousands of individual compounds present in smoke. Smoke composition can vary widely and depends on multiple factors, including how efficiently a fuel burns, the fuel type and moisture content, the fire temperature, wind conditions, and other weather-related influences. Different types of wood and vegetation are composed of varying amounts of cellulose, lignin, tannins and other polyphenols, oils, fats, resins, waxes, and starches, which produce different compounds that are released as smoke when burned (CARB and CDPH 2016).

The primary criteria air pollutant of concern from smoke is $PM_{2.5}$, a criteria air pollutant for which a NAAQS and CAAQS have been established. As compared to PM_{10}, $PM_{2.5}$ (including UFP) is transported farther from a burn site and can cause more severe, adverse health impacts because of its ability to penetrate more deeply into lung tissue. Emergency visits for respiratory symptoms increase in wildfire smoke-affected areas; specifically, patients are more likely to visit the emergency room for asthma, bronchitis, dyspnea, and symptoms of chronic obstructive pulmonary disease (Black et al. 2017a). Typically, wildfire smoke produces proportionately more $PM_{2.5}$ and UFP compared to PM_{10} (Black et al. 2017b).

The open burning of organic materials produces a higher mass of ROG, as compared to the combustion of fossil fuels. However, NO_X and SO_X emissions are comparatively lower (Black et al. 2017a). ROG emissions may oxidize with NO_X emissions from fire and other sources to contribute to spikes in ground-level ozone (NCAR 2008). Exposure to ozone may result in acute and chronic health impacts including coughing, pulmonary distress, lung inflammation, shortness of breath, and permanent lung impairment.

Although the same types of criteria air pollutants are generated by wildfires and prescribed burns, the characteristics of their smoke plumes can differ. Prescribed burns are controlled events that are carefully planned to reduce smoke-related impacts. Wildfires, however, burn under uncontrolled and unplanned circumstances. It is difficult to manage when wildfires burn, how much smoke is generated, where smoke travels, and their duration. Wildfire frequency is typically highest during summer and fall months when fuels are driest and the likelihood of adverse weather conditions (i.e., high temperatures, low relative humidity, and sustained wind speeds) are present. Under these conditions, wildfires consume more vegetation on a per-acre basis than prescribed burns, resulting in more smoke emissions (Berger et al. 2018). Wildfires also have a long smoldering phase, because wildfire containment strategies focus on extinguishing the flame phase on the perimeter of the burned areas to protect life and property, while the smoldering phase within the burned area is left to burn out, sometimes for months after a fire is contained (Graham et al. 2004). The smoldering phase of wood burning is associated with higher output of particulate matter and can account for a large proportion of the total emissions from a wildfire event (Black et al. 2017a). Moreover, wildfire smoke can lead to more severe adverse health effects than smoke from a prescribed burn. A recent Stanford University study found that children experienced greater health impacts, including a diminished immune response, when exposed to wildfire smoke than to smoke generated by prescribed burns (Prunicki et al. 2019). Thus, wildfires are generally far more likely to result in adverse air quality and public health impacts than prescribed burns (Berger et al. 2018).

MONITORING STATION DATA AND ATTAINMENT DESIGNATIONS

BAAQMD and the California Air Resources Board (CARB) operate a regional monitoring network that measures the ambient concentrations of criteria air pollutants at several monitoring stations in the SFBAAB. Existing and probable future levels of air quality in and around the Plan Area can generally be inferred from ambient air quality data collected at these monitoring stations.

The Berkeley-Aquatic Park monitoring station is the closest and most representative station to the Plan Area with recent data for ozone and $PM_{2.5}$. Table 3.3-2 summarizes the air quality data from the last 3 years (2016-2018) for ozone, $PM_{2.5}$, and PM_{10}. Because no PM_{10} data are collected at the Berkeley-Aquatic Park station, regional SFBAAB PM_{10} data are presented. These are the main pollutants of concern in the SFBAAB.

Table 3.3-2 Ambient Air Quality Data - Berkeley-Aquatic Park Station (2016-2018)[1]

	2016	2017	2018
Ozone			
Maximum concentration (1-hr/8-hr avg, ppm)	0.052/0.041	0.058/0.049	0.059/0.049
Number of days state standard exceeded (1-hr/8-hr)	0/0	0/0	0/0
Number of days national standard exceeded (8-hr)	0/0	0/0	0/0
Fine Particulate Matter ($PM_{2.5}$)			
Maximum concentration (24-hour µg/m^3)	17.3	52	166
Annual Average (µg/m^3)	*	9.1	11.9
Number of days national standard exceeded (24-hour measured[2])	*	7.1	14.2
Respirable Particulate Matter (PM_{10})			
Maximum concentration (µg/m^3)	41	98	201
Number of days state standard exceeded (measured[3])	0	25.8	13.1
Number of days national standard exceeded (measured[3])	0	0	2.9

Notes: µg/m^3 = micrograms per cubic meter; ppm = parts per million; * = Insufficient data to determine the value

1 All measurement data are from the Berkeley-Aquatic Park monitoring station data, except for PM_{10}, which is from other monitoring stations in the San Francisco Bay Area Air Basin.

2 Measured days are those days that an actual measurement was greater than the level of the state daily standard or the national daily standard. The number of days above the standard is not necessarily the number of violations of the standard for the year.

Source: CARB 2019a, data compiled by Ascent Environmental in 2020

Both CARB and the U.S. Environmental Protection Agency (EPA) use the type of monitoring data presented in Table 3.3-2 to designate an area's attainment status with respect to the NAAQS and CAAQS. Table 3.3-3 below lists the NAAQS and CAAQS and the attainment designations for the SFBAAB. The purpose of these designations is to identify those areas with air quality problems and thereby initiate planning efforts for improvement.

Table 3.3-3 Ambient Air Quality Standards and Designations for the San Francisco Bay Area Air Basin

Pollutant	Averaging Time	California Standard[2, 3]	California Attainment Status[4]	National Standards[1] Standard[3]	National Standards[1] Attainment Status[5]
Ozone	1-hour	0.09 ppm (180 µg/m^3)	N	–	–
	8-hour	0.070 ppm (137 µg/m^3)		0.070 ppm (137 µg/m^3)	N
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m^3)	A	35 ppm (40 mg/m^3)	A
	8-hour	9 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)	A	0.053 ppm (100 µg/m^3)	A
	1-hour	0.18 ppm (339 µg/m^3)		0.100 ppm	
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	–	A	0.030 ppm (80 µg/m^3)	A
	24-hour	0.04 ppm (105 µg/m^3)		0.14 ppm (365 µg/m^3)	
	1-hour	0.25 ppm (655 µg/m^3)		0.075 ppm	
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 µg/m^3	N	–	–
	24-hour	50 µg/m^3		150 µg/m^3	U

Pollutant	Averaging Time	California Standard[2, 3]	California Attainment Status[4]	National Standards[1] Standard[3]	National Standards[1] Attainment Status[5]
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 μg/m³	N	12.0 μg/m³	U/A
	24-hour	–	–	35 μg/m³	N
Lead [6]	30-day Average	1.5 μg/m³	A	–	–
	Calendar Quarter	–		1.5 μg/m³	A
	Rolling 3-Month Avg	–		0.15 μg/m³	U/A
Sulfates	24-hour	25 μg/m³	A	No National Standards	
Hydrogen Sulfide	1-hour	0.03 ppm (42 μg/m³)	U		
Vinyl Chloride [6]	24-hour	0.01 ppm (26 μg/m³)	Not Available		
Visibility-Reducing Particle Matter	8-hour	Extinction coefficient of 0.23 per kilometer — visibility of 10 mi or more	U		

Notes: μg/m³ = micrograms per cubic meter; ppm = parts per million

1 National standards (other than ozone, PM, and those based on annual averages or annual arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. The PM_{10} 24-hour standard is attained when 99 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. The $PM_{2.5}$ 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact EPA for further clarification and current federal policies.

2 California standards for ozone, CO (except in the Lake Tahoe Basin), SO_2 (1- and 24-hour), NO_2, PM, and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded. CAAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

3 Concentration expressed first in units in which it was promulgated [i.e., parts per million (ppm) or micrograms per cubic meter (μg/m³)]. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas. Secondary national standards are also available from EPA.

4 Unclassified (U): a pollutant is designated unclassified if the data are incomplete and do not support a designation of attainment or nonattainment.

Attainment (A): a pollutant is designated attainment if the state standard for that pollutant was not violated at any site in the area during a 3-year period. Nonattainment (N): a pollutant is designated nonattainment if there was a least one violation of a state standard for that pollutant in the area. Non-attainment designations for ozone are classified as marginal, serious, severe, or extreme depending on the magnitude of the highest 8-Hour ozone design value at a monitoring site in a non-attainment area.

5 Nonattainment (N): any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.

Attainment (A): any area that meets the national primary or secondary ambient air quality standard for the pollutant.

Unclassifiable (U): any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

6 CARB has identified lead and vinyl chloride as toxic air contaminants with no threshold of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

Source: BAAQMD 2017b, data compiled by Ascent Environmental in 2020

TOXIC AIR CONTAMINANTS

Concentrations of Toxic Air Contaminants (TACs) are also used to indicate the quality of ambient air. A TAC is defined as an air pollutant that may cause or contribute to an increase in mortality or in serious illness, or that may pose a hazard to human health. TACs are usually present in relatively minute quantities in the ambient air; however, their high toxicity and associated health effects may pose a threat to public health even at low concentrations.

According to the *California Almanac of Emissions and Air Quality* (CARB 2013), most of the estimated health risks from TACs can be attributed to relatively few compounds, the most important being particulate matter contained in diesel exhaust (diesel PM). Diesel PM differs from other TACs in that it is not a single substance, but rather a complex mixture of hundreds of substances. Although diesel PM is emitted by diesel-fueled internal combustion engines, the composition of the emissions varies depending on engine type, operating conditions, fuel composition, lubricating oil, and whether an emissions control system is being used. Unlike the other TACs, no ambient monitoring data are available for diesel PM because no routine measurement method currently exists. However, CARB has made preliminary concentration estimates based on a PM exposure method. This method uses the CARB emissions inventory's PM_{10} database, ambient PM_{10} monitoring data, and the results from several studies to estimate concentrations of diesel PM. In addition to diesel PM, the TACs for which data are available that pose the greatest existing ambient risk in California are benzene, 1,3-butadiene, acetaldehyde, carbon tetrachloride, hexavalent chromium, para-dichlorobenzene, formaldehyde, methylene chloride, and perchloroethylene. Sources of these TACs vary considerably and include (but are not limited to) consumer products, gasoline dispensing stations, auto repair and auto body coating shops, dry cleaning establishments, chrome plating and anodizing shops, welding operations, and other stationary sources.

Diesel PM poses the greatest health risk among the 10 TACs mentioned. Since 1990, emissions of diesel PM have decreased in the SFBAAB even though population and vehicle miles traveled (VMT) are growing, because of adoption of more stringent emission standards and stationary source permit requirement. Overall, levels of most TACs, except para-dichlorobenzene, have decreased since 1990 (CARB 2013).

ODORS

Odors are generally regarded as an annoyance rather than a health hazard. However, manifestations of a person's reaction to foul odors can range from psychological (e.g., irritation, anger, or anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, and headache). The ability to detect odors varies considerably among the population and overall is quite subjective. Some individuals can smell very minute quantities of specific substances; others may not have the same sensitivity but may have sensitivities to odors of other substances. In addition, people may have different reactions to the same odor; an odor that is offensive to one person may be perfectly acceptable to another (e.g., fast food restaurant). It is important to also note that an unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. This is because of the phenomenon known as odor fatigue, in which a person can become desensitized to almost any odor and recognition only occurs with an alteration in the intensity. Odor sources of concern include wastewater treatment plants, sanitary landfills, composting facilities, recycling facilities, petroleum refineries, chemical manufacturing plants, painting operations, rendering plants, and food packaging plants (BAAQMD 2017a). None of these odorous sources or land uses are within proximity to the Plan Area. However, the odor associated with smoke generated by burning vegetation on agricultural lands, forested areas, park and open space lands, and wildlands is considered to be objectionable by some people and is less common in developed urban areas.

SENSITIVE RECEPTORS

Sensitive receptors are generally considered to include those uses where exposure to pollutants could result in health-related risks to individuals. Residential dwellings, schools, hospitals, playgrounds, and similar facilities are of primary concern because of the presence of individuals particularly sensitive to pollutants and/or the potential for increased and prolonged exposure of individuals to pollutants. Additionally, there may be specific individuals with heightened chemical sensitivity who are at a higher risk for adverse reactions to odors, including smoke generated during prescribed burns under the Plan.

As explained further in Section 3.3.2, "Regulatory Setting," California's Smoke Management Program outlines protocol that must be followed to minimize and avoid the exposure of people to smoke generated by prescribed burns. Under this program smoke-sensitive areas are defined as populated areas and other areas where an air district determines that smoke and air pollutants can adversely affect public health. These areas include, but are not limited to, towns and villages, campgrounds, trails, populated recreational areas, hospitals, nursing homes, schools, roads, airports, public events, and shopping centers. For the purposes of this EIR, smoke-sensitive areas are considered sensitive receptors.

Potential sensitive receptors in the vicinity of the Plan Area include hikers and runners that may use the fire trails within the UC Berkeley Hill Campus, as well as UC Berkeley faculty, students, staff, and visitors, nearby residents in neighborhoods adjacent to the Plan Area, and other receptors who may have heightened chemical sensitivity. The nearest residences are located directly northwest of the Plan Area, approximately 600 feet north of the Lawrence Hall of Science building, and southwest of the Plan Area, near and along Panoramic Way. Figure 3.10-1 in Section 3.10, "Noise and Vibration," depicts these residential areas in proximity to the Plan Area.

3.3.2 Regulatory Setting

Air quality in the Plan Area is regulated through the efforts of various federal, state, regional, and local government agencies. These agencies work jointly, as well as individually, to improve air quality through legislation, planning, policymaking, education, and a variety of programs. The regulations identified below are applicable at the program and project level, unless otherwise noted.

FEDERAL

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) has been charged with implementing national air quality programs. EPA's air quality mandates draw primarily from the federal Clean Air Act (CAA), which was enacted in 1970. The most recent major amendments were made by Congress in 1990. EPA's air quality efforts address criteria air pollutants, ozone precursors, and hazardous air pollutants (HAPs). EPA regulations concerning these categories of pollutants are presented in greater detail below. Requirements and standards of the CAA detailed below, as enforced by EPA, CARB, and BAAQMD, would apply to any source of, or activity generating, air pollutants under the Plan.

Criteria Air Pollutants

The CAA required EPA to establish NAAQS for six common air pollutants found throughout the U.S. referred to as criteria air pollutants. EPA has established primary and secondary NAAQS for the following criteria air pollutants: ozone, carbon monoxide (CO), NO_2, sulfur dioxide (SO_2), PM_{10}, $PM_{2.5}$, and lead. Primary standards, as shown above in Table 3.3-3, protect public health with an adequate health margin for safety. Secondary standards protect public welfare from adverse effects, including those related to effects on soils, water, crops, vegetation, human-made materials, animals, wildlife, weather, visibility, and climate. Because ozone is most often formed in the atmosphere as a secondary pollutant from its precursors, NO_X and ROG, these precursor compounds are subject to regulation as a means of reducing ambient ozone concentrations in compliance with the NAAQS.

The CAA also required each state to prepare a State Implementation Plan (SIP) for attaining and maintaining the NAAQS. The federal Clean Air Act Amendments of 1990 (CAAA) added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. California's SIP is modified periodically to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. EPA is responsible for reviewing all SIPs to determine whether they conform to the mandates of the CAA and its amendments, and whether implementation will achieve air quality goals. If EPA determines a SIP to be inadequate, EPA may prepare a federal implementation plan that imposes additional control measures. If an approvable SIP is not submitted or implemented within the mandated time frame, sanctions may be applied to transportation funding and stationary air pollution sources in the air basin.

Toxic Air Contaminants and Hazardous Air Pollutants

TACs, or in federal parlance, hazardous air pollutants (HAPs), are a defined set of airborne pollutants that may pose a present or potential hazard to human health. A TAC is defined as an air pollutant that may cause or contribute to an increase in mortality or in serious illness, or that may pose a hazard to human health. TACs are usually present in minute quantities in the ambient air; however, their high toxicity or health risk may pose a threat to public health even at low concentrations.

A wide range of sources, from industrial plants to motor vehicles, emit TACs. The health effects associated with TACs are quite diverse and generally are assessed locally, rather than regionally. TACs can cause long-term health effects such as cancer, birth defects, neurological damage, asthma, bronchitis, or genetic damage; or short-term acute affects such as eye watering, respiratory irritation (cough), running nose, throat pain, and headaches.

For evaluation purposes, TACs are separated into carcinogens and non-carcinogens based on the nature of the physiological effects associated with exposure to the pollutant. Carcinogens are assumed to have no safe threshold below which health impacts would not occur. This contrasts with criteria air pollutants for which acceptable levels of exposure can be determined and for which the ambient standards have been established. Cancer risk from TACs is expressed as excess cancer cases per one million exposed individuals, typically over a lifetime of exposure.

EPA regulates HAPs through its National Emission Standards for Hazardous Air Pollutants. The standards for a particular source category require the maximum degree of emission reduction that the EPA determines to be achievable, which is known as the Maximum Achievable Control Technology (MACT) standards. These standards are authorized by Section 112 of the CAA and the regulations are published in 40 Code of Federal Regulations (CFR) Parts 61 and 63.

Federal Advisory Committee Act

Established through a charter, the purpose of the Federal Advisory Committee Act (FACA) Wildland Fire Issues Group was to provide EPA recommendations for revising its policies for implementing the current NAAQS for PM_{10} and any new NAAQS for $PM_{2.5}$, with respect to prescribed burns and their impact. Although the Charter for the FACA for Ozone, Particulate Matter, and Regional Haze has expired, the findings of the Wildland Fire Issues Group pertain to prescribed burning in relation to air quality. Most importantly, the Interim Air Quality Policy on Wildland and Prescribed Burns was produced by the group and is the national standard when local guidelines have not been established. The document outlines the following: Smoke Management Programs; who is accountable when a prescribed burn results in exceedances of the NAAQS; and overall objectives for prescribed burns in relation to air quality (EPA 1998). Treatment activities implemented under the Plan would include prescribed burns. Although local guidelines have been established and are discussed below, the Interim Air Quality Policy on Wildland and Prescribed Burns is included to provide context on how prescribed burns are regulated at the federal level.

Prescribed Burn Smoke Management Guide

The National Wildfire Coordinating Group was originally chartered by the U.S. Secretaries of the Interior and Agriculture in 1976. In 2001, NWCG's Fire Use Working Team sponsored the creation of the Smoke Management Guide for Prescribed and Wildland Fire (NWCG 2018). The guide outlines why fire is important to the ecosystem, regulations that impact smoke management, best management practices for reducing emissions during prescribed burn, and ways to monitor air quality during prescribed burns. The EPA advises that this guide be consulted when calculating emissions for prescribed burns. Treatment activities implemented under the Plan would include prescribed burns; thus, the NWCG's Smoke Management Guide for Prescribed and Wildland Fire was consulted for emissions calculations.

STATE

The Mulford-Carrell Air Resources Act of 1968 created the California Air Resources Board (CARB) and required it to adopt statewide air quality standards, which are referred to as the CAAQS. CARB is the agency responsible for coordination and oversight of state and local air pollution control programs in California and for implementing the California Clean Air Act (CCAA). The CCAA, which was adopted in 1988, required local air districts to develop and implement plans to achieve the CAAQS.

Criteria Air Pollutants

As shown in Table 3.3-3, in addition to the six pollutants for which there are NAAQS, CARB has established CAAQS for sulfates, hydrogen sulfide, vinyl chloride, visibility-reducing particulate matter, and the above-mentioned criteria air pollutants. In most cases the CAAQS are more stringent than the NAAQS. Differences in the standards are generally explained by the health effects studies considered during the standard-setting process and the interpretation of the studies. In addition, the CAAQS incorporate a margin of safety to protect sensitive individuals.

The CCAA requires that all local air districts in the state endeavor to attain and maintain the CAAQS by the earliest date practical. The CCAA specifies that local air districts should focus attention on reducing the emissions from transportation and area-wide emission sources. The CCAA also provides air districts with the authority to regulate indirect emission sources. The CCAA and CAAQS are applicable to the Plan, because treatment activities would generate criteria air pollutants and precursors that could affect the attainment status of air basins.

Toxic Air Contaminants

TACs in California are regulated primarily through the Tanner Air Toxics Act (Assembly Bill [AB] 1807, Chapter 1047, Statutes of 1983) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (Hot Spots Act) (AB 2588, Chapter 1252, Statutes of 1987). AB 1807 sets forth a formal procedure for CARB to designate substances as TACs. Research, public participation, and scientific peer review are required before CARB can designate a substance as a TAC. To date, CARB has adopted all EPA-identified HAPs as TACs and identified 21 additional substances as TACs, including particulate matter exhaust from diesel engines (i.e., diesel PM) (CARB 2011a).

After a TAC is identified, CARB then adopts an airborne toxic control measure (ATCM) for sources that emit that particular TAC. If a safe threshold exists for a substance at which there is no toxic effect, the control measure must reduce exposure below that threshold. If no safe threshold exists, the measure must incorporate best available control technology for toxics to minimize emissions.

The Hot Spots Act requires that existing facilities that emit toxic substances above a specified level prepare an inventory of toxic emissions, prepare a risk assessment if emissions are significant, notify the public of significant risk levels, and prepare and implement risk reduction measures.

CARB has adopted diesel exhaust control measures and more stringent emissions standards for various transportation-related mobile sources of emissions, including transit buses, and off-road diesel equipment (e.g., tractors, generators). Over time, the replacement of older vehicles will result in a vehicle fleet that produces substantially lower levels of TACs than under current conditions. Mobile-source emissions of TACs (e.g., benzene, 1-3-butadiene, diesel PM) have been reduced substantially over the last decade and will be reduced further in California through a progression of regulatory measures (e.g., Low Emission Vehicle/Clean Fuels and Phase II reformulated gasoline regulations) and control technologies. With implementation of CARB's Truck and Bus Regulation, it is expected that diesel PM concentrations will continue to decrease in the future (CARB 2019b). Adopted regulations are also expected to continue to reduce formaldehyde emissions emitted by cars and light-duty trucks. As emissions are reduced, it is expected that risks associated with exposure to the emissions will also be reduced. CARB diesel exhaust control measures and mobile-source emission reduction regulatory measures are applicable to the Plan because treatment activities include the use of diesel-powered equipment and would result in mobile-source emissions of TACs.

California Code of Regulations Title 17

Title 17 of the California Code of Regulations (CCR) addresses public health issues. Division 3 of Title 17 specifically addresses issues related to air resources, such as: Air Basins and Air Quality Standards (Subchapter 1.5), Smoke Management Guidelines for Agricultural and Prescribed Burning (Subchapter 2), Toxic Air Contaminants (Subchapter 7), and Asbestos (Subchapter 7.5). These topics are relevant because treatment activities could result in criteria air pollutant and TAC emissions that affect air quality and health, including prescribed burning, and could occur in areas where naturally occurring asbestos (NOA) is present.

CARB oversees California's Smoke Management Program, which addresses potentially harmful smoke impacts from agricultural, forest, and rangeland management burning operations. The legal basis of the program is found in 17 CCR Section 80100 et. seq., *Smoke Management Guidelines for Agricultural and Prescribed Burning,* adopted by CARB on March 23, 2000 (CARB 2011b). Under these guidelines, air districts implement a daily burn authorization system under which they specify the amount, timing, and location of burns for the purposes of minimizing smoke impacts on sensitive areas, avoiding cumulative smoke impacts, and preventing public nuisances from occurring. Through the burn authorization system, air districts authorize no more burning on a daily basis than is appropriate considering meteorological and air quality conditions (CARB 2000).

Adoption of the amendments to the *Smoke Management Guidelines for Agricultural and Prescribed Burning* by CARB in 2000 triggered a CEQA analysis. CARB concluded that adoption of these guidelines would not cause significant adverse environmental impacts. CARB further concluded, in regard to air quality impacts, that compliance with the guidelines should result in reduced smoke impacts, improved air quality, and progress towards achievement of CAA and CCAA requirements, and also posited that potential benefits from the program may accrue from a reduction in risk of wildland fires because of increased prescribed burning activities (CARB 2000).

The California Wildfire Smoke Response Coordination, prepared under the auspices of CARB's California Air Response Planning Agency (CARPA) and the California Interagency and Smoke Council, provides useful information and resources seeking assistance in protecting the public's health from the impacts of smoke during wildfires (CARPA 2014).

California Smoke Management Program

All air districts in California are required to regulate prescribed burning through adoption of their own Smoke Management Program that adheres to the overall objectives and goals of the California Smoke Management Program. Prior to obtaining permission to burn from an air district, a burn manager must register the burn with the local air district, obtain an air district and/or fire agency burn permit, submit a SMP to the air district, and obtain air district approval of the SMP. Each SMP must specify the "smoke prescription," which is a set of air quality, meteorological, and fuel conditions that must exist before burn ignition may be allowed. The burn manager must also ensure that the prescribed burn meets the conditions set forth in the approved SMP before the burn is ignited. That is, even with authorization from the local air district to conduct the prescribed burn, ignition is prohibited if the conditions and requirements of the SMP are not met on-site (17 CCR Section 80160[j]). After the burn is ignited, the burn manager must make all reasonable efforts to ensure that the burn stays within the prescription of its SMP. If the burn fails to stay within the prescription, or if adverse smoke impacts are observed, the burn manager must implement the smoke mitigation measures described in the SMP.

REGIONAL

Bay Area Air Quality Management District

BAAQMD oversees the attainment and maintenance of air quality conditions in the SFBAAB, which encompasses nine counties surrounding the San Francisco Bay including Alameda and Contra Costa Counties. BAAQMD manages the SFBAAB through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. The clean air strategy of BAAQMD includes the preparation of plans and programs for the attainment of the NAAQS and CAAQS, adoption and enforcement of rules and regulations, and issuance of permits for stationary sources. BAAQMD also inspects stationary sources, responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements other programs and regulations required by the CAA and CCAA.

Projects in the SFBAAB are subject to BAAQMD's rules and regulations. Because treatment projects implemented under the WVFMP will include the use of diesel-fueled off-road equipment, prescribed burns, and other air pollutant generating activities, several BAAQMD regulations may be applicable. Specific rules applicable to the WVFMP may include:

- **Regulation 2, Rule 1, General Permit Requirements.** Includes criteria for issuance or denial of permits, exemptions, appeals against decisions of the APCO, and BAAQMD actions on applications. This regulation would apply because a burn permit will need to be issued by the BAAQMD prior to prescribed burning. Regulation 1 does not apply to open burning or air curtain burning.
- **Regulation 5, Section 5-401.15, Wildland Vegetation Management (Prescribed Burning).** Requires any public agency conducting a prescribed burn to produce and adhere to a SMP approved by the BAAQMD APCO in writing. Prescribed burns are permissible year-round but may only be conducted on a permissive burn day. The agency shall be exempt from operation fees when conducting a prescribed burn for the express purpose of wildfire prevention. The regulation applies to UC Berkeley for any prescribed burning implemented under the Plan (BAAQMD 2019b:16–17). Regulation 5 also applies to any fire occurring outdoors in the open air including the use of air curtain burners, incinerators, or destructors. An air curtain burner or incinerator operates by

forcefully projecting a curtain of air across an open, integrated combustion chamber (fire box) or open pit or trench (trench burner) in which combustion occurs (BAAQMD 2019b:1; Cabral, pers. comm. 2020).

- **Regulation 6, Rule 1, General Requirements.** Limits the quantity of particulate matter in the atmosphere by controlling emission rates, concentration, visible emissions and opacity. This rule applies to both exhaust emissions and fugitive dust emissions. This rule does not apply to emissions arising from open outdoor fires.
- **Regulation 7, Odorous Substances.** Regulation 7 places general limitations on odorous substances and specific emission limitations on certain odorous compounds. A person (or facility) must meet all limitations of this regulation but meeting such limitations shall not exempt such person from any other requirements of BAAQMD, state, or national law. The limitations of this regulation shall not be applicable until BAAQMD receives odor complaints from 10 or more complainants within a 90-day period, alleging that a person has caused odors perceived at or beyond the property line of such person and deemed to be objectionable by the complainants in the normal course of their work, travel, or residence. When the limits of this regulation become effective, as a result of citizen complaints described above, the limits shall remain effective until such time as no citizen complaints have been received by BAAQMD for 1 year. The limits of this Regulation shall become applicable again if BAAQMD receives odor complaints from five or more complainants within a 90-day period. BAAQMD staff investigate and track all odor complaints it receives and make attempts to visit the site and identify the source of the objectionable odor and assist the owner or facility in finding a way to reduce the odor. Vegetation burning and/or diesel equipment use may result in odors that affect nearby residents and other nearby members of the public.

Burn Day Designations and Smoke Management Plans

BAAQMD controls emissions from prescribed burning by regulating the amount, timing, and location of burn events to minimize impacts from smoke. Information about existing air quality conditions and meteorological predictions is used to determine whether to allow burning, and if so, the volume and locations of burning on any given day. BAAQMD is required to regulate prescribed burning through adoption of its own smoke management that adheres to the overall objectives and goals of the California Smoke Management Program. This program must include procedures for public notification and education, appropriate signage at burn sites, and receiving and reporting smoke complaints (17 CCR Section 80160). All open burning is restricted to permissive burn days, marginal burn days, or through granted variances. BAAQMD and local fire control or burn permit agencies also have the authority to be more restrictive than CARB to avoid or minimize impacts to air quality.

BAAQMD controls prescribed burn emissions specifically via Regulation 5, which requires land managers who seek to conduct a prescribed burn within the SFBAAB to submit a SMP to the BAAQMD APCO for approval prior to burning. The SMP specifies the “smoke prescription,” which is a set of air quality, meteorological, and fuel conditions that must exist before burn ignition may be allowed. BAAQMD requires SMPs for prescribed burns greater than 10 acres in size or estimated to produce more than one ton of particulate matter to include the following information: location, types, and amounts of material to be burned; expected duration of the burn; the contact information of responsible personnel; and identification of all nearby smoke-sensitive areas. EPM AQ-1 requires UC Berkeley to prepare and submit SMPs for all prescribed burns regardless of size.

SMPs for burn treatments greater than 100 acres or estimated to produce more than 10 tons of particulate matter are required to include the following additional information: meteorological conditions necessary for burning; projections of where the smoke is expected to disperse during both daytime and nighttime conditions; and contingency actions to be taken if smoke impacts occur or meteorological conditions deviate from those specified in the SMP. Regardless of the size of the burn, if smoke from a burn may impact smoke sensitive areas, SMPs must be prepared and include an appropriate monitoring component for the following types of projects: projects that will continue burning or producing smoke overnight, projects conducted near smoke sensitive areas, or as otherwise required by the air district.

In addition to obtaining authorization from BAAQMD, the burn manager must ensure that the prescribed burn meets the conditions set forth in the approved SMP before the burn is ignited. That is, even with authorization from the BAAQMD to conduct the prescribed burn, ignition is prohibited if the conditions and requirements of the SMP are not met on-site (17 CCR Section 80160[j]). After the burn is ignited, the burn manager must make all reasonable efforts to ensure that the burn stays within the prescribed area of its SMP. If the burn fails to stay within the prescribed area, or if adverse smoke impacts are observed, the burn manager shall implement smoke mitigation measures as described in the SMP. A comprehensive study of prescribed burns nationally indicate that 99 percent of burns were accomplished within the prescription and did not report escapes or near misses (Dether 2005).

After BAAQMD approves all planning requirements for a prescribed burn to be conducted in the Plan Area, including the burn permit and SMP, the burn manager may then begin making the final preparations to conduct the burn. Preparation includes mobilizing the equipment and staff resources needed to conduct the burn, notifying the public about the planned timing and specifics of the burn, and obtaining a final authorization to burn. The burn manager will work with BAAQMD and CARB to obtain forecasts of meteorology and air quality to determine optimal conditions needed to safely conduct the burn and select the best day for this treatment activity to occur. CARB and BAAQMD determine permissive burn, marginal burn, and no burn days based on smoke dispersal conditions (as specified in statute) and the risk of a burn escape. Properly conducting a prescribed burn and managing the risk of a burn escape is the responsibility of the burn manager.

LOCAL

As a constitutionally created state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies and applying local standards as thresholds of significance. Therefore, relevant local regulations and policies are summarized below.

UC Berkeley 2020 Long Range Development Plan

The UC Berkeley 2020 Long Range Development Plan (LRDP) contains the following policies related to reducing wildfires and implementing sustainability, both of which would impact air quality and are thus applicable to the Plan (UC Berkeley 2005):

- **Policy: Manage the Hill Campus landscape to reduce fire and flood risk and restore native vegetation and hydrology patterns.** UC Berkeley maintains an ongoing program of fire fuel management in the Hill Campus to reduce fire risk to the campus, LBNL, neighboring residents, and recreational visitors to adjacent park and watershed lands. While the treatment used in a given area must be customized to address its specific conditions, including vegetation type, access, and proximity to roads and structures, in general the treatments are designed to meet one or more of the following goals:
  - reducing fuel load by removing dead material, reducing plant density, and favoring species with lower fuel content,
  - reducing horizontal spread by reducing fine fuel material and by separating dense clusters of vegetation with areas of lower fuel load, and
  - reducing vertical fire spread by increasing separation of understory and crown fuels.
- **Policy: Incorporate sustainable design principles into capital investment decisions.** The policies in Strategic Investment require UC Berkeley to consider a range of alternate solutions at the feasibility phase of the project approval process. This analysis should include an evaluation of how each option supports the principles of sustainable design, which include:
  - minimizing energy use in travel to and within the campus, and
  - minimizing adverse impacts to air and water quality.

3.3.3 Impact Analysis and Mitigation Measures

ANALYSIS METHODOLOGY

Regional and local criteria air pollutant emissions and associated impacts, as well as impacts from TACs, CO concentrations, and odors, were assessed in accordance with BAAQMD-recommended methodologies. Emissions generated by mechanical and manual treatments, prescribed herbivory, and herbicide application under the WVFMP, including the Identified Treatment Projects, are compared to BAAQMD-adopted mass emission thresholds, expressed in both pounds per day (lb/day) and tons per year (tons/year). BAAQMD's mass emission thresholds are used to determine whether emissions of criteria air pollutants and precursors from these treatment types would exceed, or contribute to exceedances of, the NAAQS and CAAQS. Emissions generated by prescribed burns and combustion of vegetation in the curtain burner are evaluated with respect to the requirements of BAAQMD Regulation 5. Significance determinations account for the influence of relevant EPMs, which would be incorporated into treatment design. The full text of EPMs is presented in Section 2.6.3, "Air Quality Environmental Protection Measures."

Emissions were estimated for each treatment activity that may be conducted in the Plan Area. Treatment activity-generated emissions were estimated on both a pound per day and ton per year basis. Emissions generated by off-road equipment were estimated using emission factors from CARB's web-based ORION/OFFROAD2017 model (CARB 2017). Emissions generated by on-road vehicle trips were estimated using emission factors from the Emission Factor 2017 model (EMFAC2017, Version 1.0.2) (CARB 2020). Detailed calculations and assumptions are provided in Appendix F. The emissions resulting from treatments implemented under the Plan could vary according to multiple factors including, but not limited to, the amount of vegetation removed or treated per acre, the type and maturity of the vegetation, the number of workers and equipment needed for each treatment project, and the types of equipment used. For these reasons, all assumptions involved in the emissions calculations for the overall WVFMP and Identified Treatment Projects are included in Appendix F. The emissions level estimates are considered to be conservative because it is assumed that most of the emissions-generating equipment would be operated continuously during the entirety of 8 hour work shifts; however, equipment would typically operate up to 75 percent of time during a shift.

Treatment-related TAC emissions are discussed qualitatively based on the potential for treatments to result in increased exposure of sensitive receptors to high concentrations of TACs. This discussion addresses the types of TAC-emitting activities that could occur, including diesel PM being emitted by diesel-powered off-road equipment and TACs contained in smoke emissions from prescribed burning.

The potential for treatments implemented under the WVFMP to create objectionable odors affecting a substantial number of people is also discussed qualitatively with a focus on the types of odor sources, their intensity, smoke prevention measures, and the proximity of the odor-generating treatment activity to people.

SIGNIFICANCE CRITERIA

An impact to air quality would be significant if implementation of the WVFMP would:

- conflict with or obstruct implementation of the applicable air quality plan;
- for all treatment activities other than prescribed burning (broadcast burning of vegetation and pile burning), result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard; an increase would be cumulatively considerable if it would:
  - result in treatment activity–generated emissions of criteria air pollutants or precursors that exceed BAAQMD-recommended average daily thresholds of 54 lb/day or annual threshold of 10 tons/year for ROG, NO_X, and $PM_{2.5}$, or average daily threshold of 82 lb/day or annual threshold of 15 tons/year for PM_{10};
- for prescribed burning (broadcast burning of vegetation and pile burning) conflict with the requirements of BAAQMD Regulation 5
- expose sensitive receptors to substantial pollutant concentrations; specifically:
  - result in, or contribute to, the exceedance of the NAAQS for CAAQS for any criteria air pollutant; or
  - expose sensitive receptors to a substantial increase in TAC emissions that would result in an incremental increase in an individual's lifetime cancer risk (i.e., the risk of contracting cancer) greater than 10 in one million, or a noncarcinogenic hazard index of 1.0 or greater, or an increase in the annual average ambient $PM_{2.5}$ concentration greater than 0.3 µg/m^3; or
- result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

ISSUES NOT EVALUATED FURTHER

All issues identified in State CEQA Guidelines Appendix G and listed above under Thresholds of Significance are discussed below.

IMPACT ANALYSIS

Impact AQ-1: Generate Emissions of Criteria Air Pollutants and Precursors during Treatment Activities that Would Contribute to the Exceedances of the NAAQS and CAAQS

Because all prescribed burns (broadcast burning of vegetation and pile burning) and incineration of biomass by an air curtain burner under the overall WVFMP would comply with BAAQMD Regulation 5, which requires that they follow tailored SMPs and only take place on permissive burn days, the emissions generated by these activities would not result in, or contribute to, nonattainment of the NAAQS or CAAQS for criteria air pollutants or conflict with air quality planning efforts in the region. However, emissions of criteria air pollutants and precursors generated by mechanical and manual treatments under the overall WVFMP, including the Identified Treatment Projects, would likely exceed BAAQMD-established mass daily emission thresholds for ozone precursors and, therefore, result in, or contribute to, the nonattainment status with respect to the NAAQS and CAAQS for ozone in the SFBAAB, including in areas where people reside and work. Such localized exceedances could result from off-road equipment operated during treatment activities and emissions generated by worker commutes and haul trucks. Because of these possible adverse effects to air quality on both a regional level and local level and the resulting health effects that could be experienced by exposed receptors, this impact would be **significant** for the overall WVFMP and for the Identified Treatment Projects.

<u>Overall WVFMP (Program-level Analysis)</u>

Treatment activities implemented under the WVFMP would result in emissions of criteria air pollutants and precursors directly generated by site preparation, the combustion of vegetation during broadcast burns, pile burns, and in the air curtain burner; off-road equipment, on-road vehicles, and machine-powered hand tools; and worker commute trips and hauling of equipment, livestock, and vegetative debris.

Site Preparation

Emissions would be generated by earth moving equipment used to perform minor grading to prepare landing sites for the staging of equipment that would be used in various treatment activities. Grading activity would take place prior to vegetation treatments being implemented. Based on emission calculations that are presented in detail in Appendix F, "Air Quality and Greenhouse Gas Emissions Calculations," it is estimated that this grading would generate approximately 0.8 lb/day of ROG, 9.8 lb/day of NO_X, 0.3 lb/day of PM_{10}, and 0.3 lb/day of $PM_{2.5}$. These levels would not exceed the respective BAAQMD-recommended mass emission thresholds of 54 lb/day for ROG, NO_X and $PM_{2.5}$, or 82 lb/day for PM_{10}.

Prescribed Broadcast Burning and Biomass Disposal (Pile Burning and Incineration)

Broadcast burns, pile burns, and the burning of removed vegetation in an air curtain burner would be the most intensive activities in terms of mass daily emissions. Based on emission calculations that are presented in detail in Appendix F, "Air Quality and Greenhouse Gas Emissions Calculations," it is estimated that a 1-acre broadcast burn, or the combustion of vegetation removed from 1-acre of a treatment area in pile burns or an air curtain burner, would generate approximately 252 lb/day of ROG, 81 lb/day of NO_X, 222 lb/day of PM_{10}, and 201 lb/day of $PM_{2.5}$. BAAQMD staff explain, however, that BAAQMD's mass daily emission levels should not be used to determine the significance of emissions generated by burns because broadcast burns, pile burns, and vegetation burned in an air curtain burner are uniquely regulated by BAAQMD Regulation 5, Section 5-401.15 (Flores, pers. comm., 2020). Regulation 5 requires all burn activity to only occur with written approval of a SMP by BAAQMD and only be conducted on permissive burn days. The SMPs are designed so that people will not be exposed to any amount of harmful pollutants that would create acute health effects. For instance, BAAQMD does not allow burns on days when ambient concentrations of ozone and particulate matter are high. As explained in

Section 3.2.2, "Regulatory Setting," each SMP must specify the smoke prescription, which is a set of air quality, meteorological, and fuel conditions that must exist before burn ignition is permitted. Furthermore, after a burn is ignited, the burn manager must make all reasonable efforts to ensure that the burn stays within the prescription of its SMP. While BAAQMD requires SMPs for prescribed burns greater than 10 acres in size, EPM AQ-1 requires UC Berkeley to prepare and submit SMPs to BAAQMD for all prescribed burns on the Hill Campus regardless of size. As a result of these requirements, burns would only be implemented under the Plan when meteorological conditions and fuel conditions are favorable such that the burns would not result in the exposure of people to smoke; and when ambient air quality conditions are favorable such that the burns would not result in, or contribute to, concentrations of criteria air pollutants in the SFBAAB that would exceed the NAAQS or CAAQS, which have been established to protect the health of the most sensitive groups. Therefore, prescribed broadcast burns, pile burns, and incineration of biomass implemented under the Plan would not conflict with air quality planning efforts in the SFBAAB.

Mechanical and Manual Treatments, Prescribed Herbivory, and Herbicide Application

Emissions of criteria air pollutants and precursors would also be generated by mechanical and manual treatments, prescribed herbivory treatments and herbicide application under the Plan. To provide a general understanding of the scale of emissions associated with treatment activities, the emissions for each treatment activity (i.e., mechanical treatment, manual treatment, managed herbivory, and herbicide application) are presented in Tables 3.3-4 and 3.3-5. Table 3.3-4 shows the estimated annual emissions broken down by crew type. Table 3.3-5 shows the daily emissions for each type of treatment crew. The estimates in both tables are based on the types and number of equipment that would be used by one treatment crew and the number of workers per treatment crew. The estimates also assume all the treatment activity would be initial treatments in areas that have not been treated recently before and are more equipment intensive rather than subsequent maintenance treatments that would involve less equipment and fewer workers—some maintenance treatments would involve as few as two workers using loppers or weed whips (string trimmers). The estimates include emissions from off-road equipment and worker commute trips. Unlike emissions from burning, emissions from these other treatment activities would not be subject to BAAQMD Regulation 5 or any other BAAQMD rule that restricts the timing or meteorological and air quality conditions in which these activities can occur. Rather the emissions estimates are compared against BAAQMD's mass emission thresholds to determine whether an exceedance of any threshold would occur. Detailed input parameters and assumptions are provided in Appendix F, "Air Quality and Greenhouse Gas Emissions Calculations."

Table 3.3-4 Annual Emissions of Criteria Air Pollutants and Precursors Generated by One Treatment Crew

Annual Treatment of 200 Acres (10 percent Prescribed Broadcast Burns)[1]	ROG (tons/year)	NO_X (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Emissions of 180 Acres Treated by Non-Burning Methods (includes pile burning and incineration of biomass)[2]	2.0	1.0	0.7	0.6
Emissions of 20 Acres Treated by Prescribed Broadcast Burning	2.5	0.8	2.2	2.0
Total Maximum Annual Emissions[3]	4.5	1.8	2.9	2.6
BAAQMD Annual Emissions Threshold	**10**	**10**	**15**	**10**

Notes: ROG = reactive organic gases; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 microns or less; $PM_{2.5}$ = fine particulate matter with an aerodynamic diameter of 2.5 microns or less.

1 The annual emission levels represent the level of emissions from treatment activity during an average year, during which UC Berkeley would implement vegetation treatment activities on 200 acres. It is assumed that approximately 10 percent of the area treated would be treated with prescribed broadcast burns and 90 percent would be subject to mechanical or manual treatments with follow-up herbicide application.

2 Annual emissions level estimates assume approximately 60 percent of the vegetative debris from mechanical and manual treatments would be hauled to, and combusted in, the air curtain burner at the UC Berkeley Richmond Field Station; approximately 5 percent of the vegetative debris from these treatments would be piled and burned on site; and approximately 35 percent of the vegetative debris would be masticated and spread on site.

3 Per BAAQMD direction, prescribed broadcast burn, pile burn, and air curtain incineration emissions are not included in the determination of threshold exceedance but are included here for informational purposes.

See Appendix F for detailed calculations.

Source: Emissions estimates calculated by Ascent Environmental in 2020.

Table 3.3-5 Daily Emissions of Criteria Air Pollutants and Precursors Generated by One Treatment Crew

Treatment Activity[1]	ROG (lb/day)	NO_X (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)
Mechanical Treatment[2]	20.7	21.8	1.1	0.9
Manual Treatment[2]	29.4	7.9	0.3	0.2
Herbicide Application	<0.1	<0.1	<0.1	<0.1
Prescribed Herbivory[3] (0.3 acre/day)	<0.1	<0.1	<0.1	<0.1
BAAQMD Average Daily Emissions Threshold	**54**	**54**	**82**	**54**

Notes: lb/day = pounds per day; ROG = reactive organic gases; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 microns or less; $PM_{2.5}$ = fine particulate matter with an aerodynamic diameter of 2.5 microns or less.

1 The daily emissions from prescribed broadcast burns, pile burns, and incineration of biomass in an air curtain are not included in this table because they would only occur on permissible burn days as determined by BAAQMD pursuant to BAAQMD Regulation 5 and BAAQMD has determined that its recommended mass emission thresholds should not be used to evaluate emissions from burning.

2 Daily emission rates for mechanical and manual treatments assume 100 percent of the vegetative debris from these treatments would be hauled to the UC Berkeley Richmond Field Station to be incinerated in an air curtain burner, in order to present the maximum levels of emissions associated with a single mechanical or manual treatment crew in one day. Therefore, daily emissions from hauling biomass are included; however, daily emissions from burning biomass are not included because those emissions would be regulated pursuant to BAAQMD Regulation 5.

3 Livestock used for prescribed herbivory would treat approximately 0.3 acres of vegetation per day.

See Appendix F for detailed calculations.

Source: Emissions estimates calculated by Ascent Environmental in 2020.

As shown in Table 3.3-4, emissions that would be generated during a peak year of treatments would not exceed BAAQMD's annual mass emission thresholds for any criteria air pollutant or precursor.

As shown in Table 3.3-5, the emissions generated by any single treatment crew would not exceed BAAQMD's daily mass emission thresholds. However, up to three treatment crews could be working on the same day and their combined emission level could exceed BAAQMD's daily mass emission thresholds. For instance, BAAQMD's threshold for ROG (54 lb/day) and NO_X (54 lb/day) would be exceeded if three mechanical or manual treatment crews were working on the same day. Therefore, the levels of ozone precursors (i.e., ROG and NO_X) emitted during implementation of the WVFMP could result in a cumulatively considerable net increase in ozone for which the SFBAAB is designated as non-attainment with respect to the applicable NAAQS and CAAQS, which represent concentration limits needed to adequately protect human health. This could conflict with air quality planning efforts in the region. Because implementation of the overall WVFMP could contribute to exceedances of the NAAQS and CAAQS, this impact would be **significant**.

Identified Treatment Projects

Treatment activities to implement the Identified Treatment Projects would consist of manual, mechanical, and herbicide treatments, as detailed in Table 2-3, in Chapter 2, "Project Description." No prescribed broadcast burning or pile burning would be conducted as part of the Identified Treatment Projects. The Identified Treatment Projects would be conducted in 2021 and 2022. Estimated levels of annual emissions of criteria air pollutants and precursors associated with the proposed Identified Treatment Projects are summarized in Table 3.3-6

Table 3.3-6 Annual Emissions of Criteria Air Pollutants and Precursors Generated by Identified Treatment Projects

	ROG (tons/year)	NO_X (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Annual Total of Identified Treatment Projects[1]	2.1	1.5	<0.1	<0.1
BAAQMD Annual Emissions Threshold	10	10	15	10

Notes: tons/year = tons per year; ROG = reactive organic gases; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 microns or less; $PM_{2.5}$ = fine particulate matter with an aerodynamic diameter of 2.5 microns or less.

[1] The annual emission estimates assumes all Identified Treatment Projects would occur in one year's time. These estimates are conservative because the Identified Treatment Projects would occur over two years.

See Appendix F for detailed calculations.

Source: Emissions estimates calculated by Ascent Environmental in 2020.

As shown in Table 3.3-6, BAAQMD annual emissions thresholds would not be exceeded from implementation of the Identified Treatment Projects, even if all Identified Treatment Projects were implemented in the same year; this assumption is conservative because treatments are planned to occur over two years.

However, the daily emissions generated by individual treatment crews for each treatment type for the Identified Treatment Projects would be the same as shown in Table 3.3-5. As discussed in the analysis of the overall WVFMP above, and shown in Table 3.3-5, the emissions generated by any single treatment crew would not exceed BAAQMD's daily mass emission thresholds. However, it is possible that up to three different treatments could occur at the same time requiring concurrent work by three crews; this would result in combined emission levels of ROG and/or NO_X that exceed the BAAQMD threshold of 54 lb/day for these ozone precursors.

Therefore, the levels of ozone precursors (i.e., ROG and NO_X) emitted during implementation of the Identified Treatment Projects could result in a cumulatively considerable net increase in ozone for which the SFBAAB is designated as non-attainment with respect to the applicable NAAQS and CAAQS, which represent concentration limits of criteria air pollutants needed to adequately protect human health. This could conflict with air quality planning efforts in the region. Because implementation of the Identified Treatment Projects could contribute to exceedances of the NAAQS and CAAQS, this impact would be **significant**.

<u>Summary</u>

Because all prescribed broadcast burns, pile burns, and incineration of biomass in an air curtain under the Plan would comply with BAAQMD Regulation 5, which requires that they follow tailored SMPs and only take place on permissive burn days, the emissions generated by prescribed burns implemented under the overall WVFMP would not result in, or contribute to, nonattainment of the NAAQS or CAAQS for criteria air pollutants or conflict with air quality planning efforts in the region. No burns would be permitted by BAAQMD without a SMP showing that they will be managed in accordance with the requirements of Regulation 5. If a burn goes out of prescription (i.e. not complying with the SMP) then it must be extinguished immediately pursuant to Regulation 5. The short amount of time between when a burn goes out of prescription and is extinguished would not result in significant emissions of criteria pollutants to the atmosphere.

Emissions of criteria air pollutants and precursors generated by mechanical and manual treatments under the overall WVFMP, including the Identified Treatment Projects, would not exceed BAAQMD-established annual mass emission thresholds. However, emissions of criteria air pollutants and precursors generated by mechanical and manual treatments under the overall WVFMP, including the Identified Treatment Projects, would likely exceed BAAQMD-established daily mass emission thresholds for ozone precursors (i.e., ROG and NO_X) and, therefore, result in, or contribute to, the nonattainment status with respect to the NAAQS and CAAQS for ozone in the SFBAAB. Such localized exceedances could result from ozone precursors emitted by off-road equipment during treatment activities and by worker commutes and haul trucks. In addition, treatment activity–related emissions could result in, or contribute to, localized exceedances of NAAQS and CAAQS in areas where people reside and work. Because of these possible adverse effects to air quality on both a regional level and local level and the resulting health effects that could be experienced by exposed receptors, this impact would be **significant** for the overall WVFMP and for the Identified Treatment Projects.

Mitigation Measures

Mitigation Measure AQ-1: Limit the Number and Mix of Crews and/or Use Electric Chainsaws for Mechanical and/or Manual Treatment Crews Operating on the Same Day

UC Berkeley shall limit the number and mix of mechanical and manual treatment crews working on the same day in the Plan Area and/or use only electric-powered hand-held chain saws such that the combined levels of ROG or the combined levels of NO_X will not exceed BAAQMD's threshold of 54 lb/day. Prior to the start of mechanical or manual treatment activity involving more than one treatment crew on a single day, UC Berkeley shall develop a plan for ensuring that the combined emissions of ROG or NO_X generated by all the crews that would operate simultaneously on any single day would not exceed 54 lb/day. UC Berkeley shall only allow mechanical or manual treatment activity to occur with a plan in place that ensures emissions of ROG or NO_X would not exceed 54 lb/day.

For the purpose of implementing this mitigation, a mechanical crew consists of up to nine workers using up to nine pieces of power equipment, including heavy equipment (e.g., feller/bunchers, masticators); and a manual treatment crew consists of up to 15 workers using up to 15 pieces of handheld power equipment (e.g., chain saws, brush cutters, weed whips).

To achieve this, UC Berkeley may determine the number and mix of mechanical and manual treatment crews using the daily emission levels for one crew presented in Table 3.3-5. For instance, UC Berkeley will not allow more than one manual treatment crew to operate on the same day because the combined level of ROG emissions from two manual treatment crews would be 58.8 lb/day, which would exceed BAAQMD's threshold of 54 lb/day. UC Berkeley could allow two mechanical treatment crews to be active on the same day, or allow one mechanical treatment crew and one manual treatment crew to be active on the same day, because the combined level of emissions under these scenarios would not exceed BAAQMD's threshold of 54 lb/day for ROG or NO_X.

Rather than, or in combination with, limiting the number and mix of mechanical and manual treatment crews working on the same day to reduce ROG and NO_X emissions below BAAQMD thresholds, UC Berkeley may use electric powered hand-held chain saws instead of petroleum powered chainsaws. The use of electric powered chainsaws would eliminate all ROG and NO_X emissions generated by petroleum-powered chain saws and result in lower daily emissions of ROG and NO_X generated by mechanical and manual treatment crews. Daily emission levels of different treatment crew types using electric chain saws instead of petroleum-powered chain saws are presented in Table 3.3-7.

For example, using the daily emission levels presented in Table 3.3-7, UC Berkeley could allow up to two mechanical treatment crews and one manual treatment crew, which would generate combined daily emissions levels of 10.9 lb/day of ROG and 50.2 lb/day of NO_X. UC Berkeley will only implement these combinations if all the crews would use electric chainsaws in place of any hand-held petroleum powered chain saws.

If needed, UC Berkeley will use a mix of multiple treatment crews with and without electric chainsaws if, based on the daily emission levels presented in Table 3.3-5 and Table 3.3-7, the combined levels of ROG and NO_X would not exceed BAAQMD's recommended threshold of 54 lb/day.

<u>Significance after Mitigation</u>

WVFMP and Identified Treatment Projects

Mitigation Measure AQ-1 requires UC Berkeley to limit the number and mix of mechanical and manual treatment crews working on the same day in the Plan Area and/or use only electric-powered hand-held chain saws such that the combined levels of ROG or the combined levels of NO_X would not exceed BAAQMD's threshold of 54 lb/day. Table 3.3-7 shows the daily emissions levels of different treatment crew types if electric chain saws are used instead of petroleum-powered chain saws.

Table 3.3-7 Daily Emissions of Criteria Air Pollutants and Precursors Generated by One Treatment Crew if Electric Chainsaws are Used Instead of Petroleum-Powered Chainsaws

Treatment Activity[1]	ROG (lb/day)	NO_X (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)
Mechanical Treatment[2]	3.6	21.4	1.0	0.9
Manual Treatment[2]	3.7	7.4	0.2	0.2
Herbicide Application	<0.1	<0.1	<0.1	<0.1
Prescribed Herbivory[3] (0.3 acre/day)	<0.1	<0.1	<0.1	<0.1
BAAQMD Average Daily Emissions Threshold	**54**	**54**	**82**	**54**

Notes: lb/day = pounds per day; ROG = reactive organic gases; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 microns or less; $PM_{2.5}$ = fine particulate matter with an aerodynamic diameter of 2.5 microns or less.

1 The daily emissions from prescribed broadcast burns, pile burns, and incineration of biomass in an air curtain are not included in this table because they would only occur on permissible burn days as determined by BAAQMD pursuant to BAAQMD Regulation 5 and BAAQMD has determined that its recommended mass emission thresholds should not be used to evaluate emissions from burning.

2 Daily emission rates for mechanical and manual treatments assume 100 percent of the vegetative debris from these treatments would be hauled to the UC Berkeley Richmond Field Station to be incinerated in an air curtain burner, in order to present the maximum levels of emissions associated with a single mechanical or manual treatment crew in one day. Therefore, daily emissions from hauling biomass are included; however, daily emissions from burning biomass are not included because those emissions would be regulated pursuant to BAAQMD Regulation 5.

3 Livestock used for prescribed herbivory would treat approximately 0.3 acres of vegetation per day.

See Appendix F for detailed calculations

Source: Emissions estimates calculated by Ascent Environmental in 2020.

Pursuant to Mitigation Measure AQ-1, UC Berkeley would use the per-crew emissions in Tables 3.3-5 and 3.3-7 to determine the number of crews, treatment activities conducted by each crew, and the use of electric chainsaws by each crew that could operate concurrently without exceeding BAAQMD's daily emission thresholds for ROG and NO_X. This would eliminate the potential for treatments implemented under the WVFMP, including the Identified Treatment Projects, to result in, or contribute to, exceedances of the NAAQS and CAAQS in SFBAAB or to conflict with air quality planning efforts in the SFBAAB. No burns would be permitted by BAAQMD without a SMP showing that they would be managed in accordance with the requirements of Regulation 5. If a burn goes out of prescription (i.e. not complying with the SMP) then it must be extinguished immediately. The short amount of time between when a burn goes out of prescription and is extinguished would not result in significant emissions of criteria pollutants to the atmosphere. Therefore, with implementation of Mitigation Measure AQ-1, this impact would be reduced to **less than significant** for both the overall WVFMP and the Identified Treatment Projects.

Impact AQ-2: Expose People to Toxic Air Contaminants Emitted by Prescribed Burns and the Related Health Risk

Prescribed broadcast burns and pile burns conducted under the WVFMP could result in the short-term exposure of people to concentrations of TACs that would result in an associated acute health risk with a Hazard Index greater than 1.0. If such exposure occurred, this would be a **significant** impact for the overall WVFMP.

None of the Identified Treatment Projects would include prescribed broadcast burning or pile burning; therefore, **no impact** would occur.

For the purposes of this impact analysis, prescribed burning encompasses both broadcast burning and pile burning as the emissions mechanism (i.e., combustion of vegetation) and pollutants are the same. The primary air pollutant of concern from smoke generated by prescribed burning is $PM_{2.5}$. $PM_{2.5}$ is a criteria air pollutant, subject to the health-based NAAQS and CAAQS (exceedance of NAAQS and CAAQS for $PM_{2.5}$ is discussed in Impact AQ-1).

As discussed in Section 3.3.1, "Environmental Setting," smoke from prescribed burning generates small concentrations of TACs, such as aldehydes (including formaldehyde and acrolein), and organic compounds, such as polycyclic aromatic hydrocarbons (PAHs) and benzene. There is also the possibility that some TACs may be released from burning vegetation that has previously been treated with herbicides. However, researchers investigating this topic detected no herbicides in the emissions of prescribed fires occurring within months of their application as many herbicide compounds decompose at high temperatures (McMahon and Bush 1992; NWCG 2018). Although the concentrations of TACs within smoke generated by prescribed burns are much lower than concentrations of $PM_{2.5}$, exposure to TACs emitted by prescribed burning may potentially result in adverse short- and long-term health effects (CARB and CDPH 2016). Risk factors published for these TACs indicate that exposures can result in short- and/or long-term health effects depending on the dose and duration of exposure (CARB 2018). The potential for receptors located near prescribed burn sites to be exposed to TACs and experience short- and long-term health effects is addressed below. Published research has studied worker (i.e., firefighter) exposure to TACs during burning; the results of these studies are used to inform the analysis of the adverse effects resulting from human exposure to TACs from prescribed burns in general.

Overall WVFMP (Program-level Analysis)

Short-Term Exposure to TACs Resulting in Acute Health Effects

Short-term exposure to TACs found in wood smoke could result in acute health impacts such as eye watering, respiratory irritation (cough), running nose, throat pain, and headaches. Exposure to TACs found in wood smoke may also exacerbate existing conditions, such as asthma, bronchitis, chronic obstructive pulmonary disease, and cardiovascular episodes, including stroke, heart failure and cardiac dysrhythmia (Domitrovich et al. 2017). Individuals may also become more susceptible to the effects of COVID-19 following short-term exposures to TACs due to inflammation and oxidative stress in lung tissue (Hendryx & Luo 2020). Studies evaluating exposure of firefighters to smoke from prescribed burns have compared measured exposure levels at or adjacent to burn sites to the Permissible Exposure Limits (PEL) established by the U.S. Occupational Safety and Health Administration's (OSHA) and to more stringent Occupational Exposure Limits (OELs) established by Cal/OSHA and the National Institute for Occupational Safety and Health (NIOSH). Although studies have not found the time-weighted average TAC exposure levels that would exceed OSHA's PELs, up to 14 percent of firefighters evaluated in the studies were exposed to short-term respiratory irritant levels above the more stringent OELs (NWCG 2018, Reinhardt et al. 2000). Studies also found that the level of acute health effects experienced by firefighters from short-term exposure to formaldehyde, acrolein, benzene, and CO exceeded a Hazard Index of 1.0, which is considered the safety threshold for acute health impacts (NWCG 2018). The highest levels of exposure to TACs occurred when burn personnel were maintaining prescribed burns within designated containment lines and performing direct attack of spot fires that crossed containment lines. These events and the associated smoke exposures occur more frequently during stronger winds, which hamper fire management and can carry the convective plume of smoke into the breathing zone of firefighters (Reinhardt and Ottmar 2004).

As discussed under Impact AQ-1, prescribed burn smoke exposure, like other emissions, is dependent on proximity to the source. The studies described above focus on exposure of firefighters, which are by necessity the nearest receptors to smoke during prescribed burning. The general population would be further from smoke than firefighters but may also be exposed. However, because smoke generally dissipates over distance, any nearby people would experience lower concentrations of TAC-containing smoke than fire personnel working within or adjacent to burn areas.

EPM AQ-1, as presented in Section 2.6.3, "Air Quality Environmental Protection Measures," requires prescribed burns conducted by UC Berkeley crews to follow all approved safety procedures under BAAQMD Regulation 5, including developing and implementing a SMP. Burning may only be conducted in compliance with a burn authorization program and SMP approved by BAAQMD. For safety reasons, the public would be restricted from areas where active burns would take place under the Plan, which would also prevent or minimize smoke exposure.

Implementing the practices and precautions detailed the SMP developed for each prescribed burn, as required by BAAQMD Regulation 5, is intended to ensure that burns stay within their prescription and the exposure of the public to smoke is minimized. For instance, prescribed burns can only occur when BAAQMD determines that the right air quality, meteorological, and fuel conditions exist and a designated burn manager must implement contingency actions, including but not limited to immediately extinguishing a prescribed burn if smoke impacts occur or meteorological conditions deviate from those specified in the SMP. However, despite adherence to the SMP and other precautionary measures, there is no guarantee that smoke from every burn would behave as predicted and that people would not be exposed to TACs from smoke. Common reasons that prescribed burns have gone out of prescription are abnormal weather conditions, greater fuel loading than anticipated, and unexpected winds (Dether 2005). Despite the best efforts to control burns, there remains the possibility that a prescribed burn may go out of prescription and expose nearby receptors to smoke. Therefore, prescribed burns implemented under the WVFMP have the potential to expose people to short-term concentrations of TACs that may result in acute health risk with a Hazard Index greater than 1.0.

Long-Term Exposure Resulting in Chronic Health Effects

Exposure to the types of TACs contained in smoke generated by prescribed burns could result in chronic long-term health risk, including elevated cancer-risk. The long-term public health impacts of prescribed burning are not well studied; however, a human health risk assessment conducted on wildland firefighters found that the levels of PAHs in the smoke wildland firefighters were exposed to were not the major contributors to their overall level of cancer risk (NWCG 2018). Short-term elevated exposures (i.e., over days to weeks) to carcinogens found in wildfire smoke were found to be small relative to total lifetime exposures to carcinogens in other, more common combustion sources (CARB and CDPH 2016).

The dose to which receptors are exposed is the primary factor used to determine health risk (i.e., potential exposure to TAC emission levels that exceed applicable standards). Dose is a function of concentration over time. Prescribed burns conducted under the WVFMP would typically last one day and most, if not all, would stay within prescription such that the movement of smoke plumes to areas where residences or other people are present would not occur. BAAQMD would not permit a prescribed burn during meteorological conditions that would result in smoke staying in the air where people are present. This would also be prevented by adherence to the individual SMP that is developed and approved by BAAQMD for each prescribed burn. Thus, it is not anticipated that the dose resulting from any prescribed burns conducted under the WVFMP would expose people to a level of chronic (long-term), noncarcinogenic risk that exceeds a Hazard Index of 1.0 or to an incremental increase in cancer risk that exceeds 10 in one million.

Summary

In summary, the increase in prescribed burn activity under the WVFMP would not result in the long-term exposure of TAC-containing smoke in places where people live or spend time and, therefore, is not anticipated to expose people to a level of chronic, noncarcinogenic risk that exceeds a Hazard Index of 1.0 or to an incremental increase in cancer risk that exceeds 10 in one million. However, despite adherence to all the safety measures in the SMP, unpredictable changes in weather could occur during prescribed burns; if this occurred, it could result in the short-term exposure of residences and places where people spend time to concentrations of TACs and associated levels of acute health risk with a Hazard Index greater than 1.0. This would be a **significant** impact.

As discussed in Section 3.3.1, "Environmental Setting," wildfires are a large source of TACs and represent a greater public health concern than prescribed burns because of their uncontrolled nature, higher level of fuel consumption, and longer duration. Wildfires may last for weeks, potentially resulting in a longer exposure of receptors to TACs from smoke emissions over a broad geography. Most critically, wildfires often burn structures and other items made of synthetic materials not present in vegetation, thus releasing a wide array of polychlorinated dioxins, furans, and biphenyls, and other toxic compounds not associated with prescribed burns that could cause adverse health effects when inhaled (NWCG 2018). As described in Chapter 2, "Project Description," a primary purpose of the WVFMP is to reduce the occurrence and severity of wildfire in the Plan Area. However, given the unpredictability of wildfire, the variability in TAC emission characteristics of wildfire fuels (i.e., grass, shrub, tree, structures), and the possible variability in the composition of TAC emissions during prescribed burns under the WVFMP, evaluating the net effect of the Plan on TAC exposures associated with wildfire and wildfire response is not possible, nor is it pertinent to determining the significance of short-term exposure to TACs under CEQA.

Identified Treatment Projects (Project-level Analysis)

None of the Identified Treatment Projects would include prescribed burning; therefore, **no impact** would occur.

Mitigation Measures

Mitigation Measure AQ-2: Prevent and Minimize Smoke Emissions and Alert the Public of Upcoming Prescribed Burns

UC Berkeley shall incorporate all feasible measures to prevent and minimize smoke emissions as part of the precautionary measures required in SMPs, pursuant to BAAQMD Regulation 5 and EPM AQ-1, for the unintended occurrence when a prescribed burn may go out of prescription and adversely affect offsite receptors. Additionally, in accordance with EPM AD-3, UC Berkeley shall alert the public to planned prescribed burns and give them adequate notice to take precautionary measures, such as closing windows or temporarily vacating the area, to reduce the potential for exposure.

Significance after Mitigation

Considering actions taken by the public to reduce exposure to smoke from prescribed burns would be voluntary, there are no additional feasible methods to compel the public to reduce its exposure. No burns would be permitted by BAAQMD without a SMP showing that they will be managed in accordance with the requirements of Regulation 5. If a burn goes out of prescription (i.e. not complying with the SMP) then it must be extinguished immediately. Short-term exposure to TACs in smoke could occur during the short amount of time between when a burn goes out of prescription and is extinguished. Although all feasible precautions and notifications would be included in EPM AQ-1 and EPM AD-3, the potential remains that short-term exposure to TACs from unpredictable weather changes could occur. Therefore, this impact would be **significant and unavoidable**.

Impact AQ-3: Expose People to Diesel Particulate Matter Emissions and Related Health Risk

Because of the short duration of treatment activities and because treatment activity would not take place near the same sensitive receptors for an extended period of time, diesel PM generated by treatment activities would not expose any person to an incremental increase in cancer risk greater than 10 in one million or a Hazard Index of 1.0 or greater. This impact would be **less than significant** for the overall WVFMP and for the Identified Treatment Projects.

Overall WVFMP (Program-level Analysis)

Implementation of treatments under the WVFMP would result in exhaust emissions of diesel PM from off-road equipment and haul truck trips associated with treatment activities. Mechanical treatment activities would involve the greatest number of large, heavy-duty off-road diesel equipment such as feller/bunchers, skidders, masticators, and tractors that would not be used for other treatment activities. Some diesel-powered equipment may also be used in manual treatments, such as powered hand tools, and the preparation of prescribed burn areas may include bulldozing and chaining to loosen vegetation or clearing vegetation to establish control lines. Diesel-powered on-road trucks would also be used to haul equipment and workers to and from treatment sites, haul vegetated debris offsite, and to haul livestock to project sites where prescribed herbivory would be conducted.

As described in the Regulatory Setting (Section 3.3.2), diesel PM is a TAC. The potential cancer risk from inhaling diesel PM is greater than the potential for all other diesel PM–related health impacts (i.e., acute and chronic noncancer risks) and health impacts related to other TACs (CARB 2019c).

The dose to which receptors are exposed is the primary factor used to determine health risk. Dose is a function of the concentration of a substance or substances in the environment and the duration of exposure to the substance. Dose is positively correlated with time, meaning that a longer exposure period would result in a higher exposure level for an exposed sensitive receptor. Thus, the risks estimated for an exposed receptor are higher if a fixed exposure occurs over a longer period of time. According to OEHHA, health risk assessments, which determine the potential cancer risks to people exposed to TAC emissions, should be based on a 30- or 70-year exposure period. However, such assessments should be limited to the period/duration of activities that generate TAC emissions (OEHHA 2015).

Treatment activities would progress across treatment sites such that the diesel PM generated by these activities would not take place near any single sensitive receptor for an extended period or on a frequent basis (i.e., more than once every few years). Diesel PM-emitting activities associated with treatment activities would not take place in the same area for more than one day. This means the period during which a single person could be exposed to diesel PM emissions from a treatment activity would be short relative to the 30- or 70-year exposure timeframe recommended for health risk assessments. In addition, diesel PM dissipates rapidly from the source, and exposure concentrations would decline with distance from these activities (Zhu et al. 2002:1032).

Additionally, research on vegetation treatment activities in forested areas indicates that vegetation removes particulates, including diesel PM generated by roadway traffic (i.e., on-road vehicles), from the air. It does so through the direct absorption of gaseous pollutants through leaf stomata and by dissolving water-soluble pollutants onto moist leaf surfaces (Islam et al. 2012:2, Zhang 2015:14). The research demonstrates that the presence of trees between vehicles and receptors reduces potential exposure to diesel PM along roadways. Thus, treatment activities near stands of trees would experience some of the same mitigating effect of foliage on diesel PM emitted by equipment, because the remaining trees would provide the same buffering condition identified in the research.

For the reasons stated above, it is expected that the cancer risk associated with diesel PM generated by treatment activities implemented under the WVFMP would be less than 10 in one million at any offsite receptor. Therefore, treatment activities conducted under the WVFMP would not result in the exposure of any individuals to an incremental increase in cancer risk greater than 10 in one million or a Hazard Index of 1.0. This impact would be **less than significant**. In addition, EPM AQ-2 requires UC Berkeley to implement BAAQMD measures to minimize exhaust emissions from off-road equipment by shutting down equipment when not in use and reducing maximum idling time to 5 minutes, as well as ensuring all off-road equipment is maintained and properly tuned in accordance with manufacturer's specifications.

<u>Identified Treatment Projects (Project-level Analysis)</u>

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Like the overall WVFMP, the diesel PM generated by these activities during Identified Treatment Projects would not take place near any single sensitive receptor for an extended period. Therefore, diesel PM-emitting activities conducted as part of the Identified Treatment Projects would not result in the exposure of any individuals to an incremental increase in cancer risk greater than 10 in one million or a Hazard Index of 1.0. This impact would be **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

Impact AQ-4 Expose People to Objectionable Odors from Equipment Exhaust

While the use of diesel- and gasoline-fueled machinery and power equipment during treatment activities performed under the Plan could result in temporary emissions of odorous exhaust, it is not anticipated that the levels of exhaust would be excessive, or adversely affect a substantial number of people. This would be a **less-than-significant** impact for the overall WVFMP and the Identified Treatment Projects.

The occurrence and severity of odor impacts depends on numerous factors, including: the nature and intensity of the source; frequency and duration of exposure; wind speed and direction; and the proximity and sensitivity of exposed individuals.

<u>Overall WVFMP (Program-level Analysis)</u>

Implementation of the WVFMP would not introduce any new operational sources of odors to the Hill Campus. Diesel- and gasoline-powered equipment used for treatments implemented under the Plan could result in short-term emissions of odorous diesel exhaust. Because of the spatial operational constraints of heavy equipment, it is unlikely that exhaust from multiple pieces of heavy-duty equipment would combine to affect the same noise-sensitive receptor at the same time. Also, exhaust emissions would be temporary, would not be generated at any one location for an extended period, and would dissipate rapidly from the source with an increase in distance. It is not anticipated that exhaust emission from equipment used in treatment activities would result in any odor complaints. Therefore, treatment activities conducted under the WVFMP would not create objectionable odors affecting a substantial number of people. This impact would be **less than significant**.

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Thus, exposure to objectionable odors from equipment exhaust would be the same as described above for the overall WVFMP. Implementation of the Identified Treatment Projects would not create objectionable odors affecting a substantial number of people and this impact would be **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

Impact AQ-5: Expose People to Objectionable Odors from Smoke During Prescribed Burning

Prescribed broadcast burns and pile burns conducted under the Plan could result in the short-term exposure of a substantial number of people to odorous smoke. This would be a **significant** impact for the overall WVFMP.

None of the Identified Treatment Projects would include prescribed broadcast burning or pile burning; therefore, **no impact** would occur.

For the purposes of this impact analysis, prescribed burning encompasses both broadcast burning and pile burning. Prescribed burning conducted under the Plan could result in temporary odorous smoke emissions, which could be perceived as objectionable depending on the frequency, duration, and intensity of the resultant smoke, wind speed and direction, and the proximity and sensitivity of exposed individuals.

Overall WVFMP (Program-level Analysis)

As discussed in Section 3.3.2, "Regulatory Setting," prescribed burning implemented under the Plan would be conducted in accordance with BAAQMD Regulation 5 regarding open burning and in accordance with the approved SMP and burn plan. SMPs are intended to reduce smoke impacts from prescribed burning and must include basic information such as the location, types, and amounts of material to be burned; expected duration of the fire; identification of responsible personnel; and identification of all smoke-sensitive areas. Burns also require additional information such as meteorological conditions necessary for burning, projections of where the smoke is expected to travel (both day and night), contingency actions to be implemented if smoke impacts occur or meteorological conditions deviate from those specified in the SMP, and monitoring.

Prescribed burning would occur no more than a few days in any given year, and the majority of prescribed burns would be five acres or less, with the maximum land area of any single burn not exceeding 27 acres. Therefore, exposure in any given location to odorous smoke emissions would occur infrequently over a period of a few days. Additionally, as discussed in Impact AQ-2, when in prescription, prescribed burns would not expose receptors to the resulting airborne emissions, including smoke and its associated odors.

However, despite adherence to a SMP, infrequent occurrence of prescribed burns, and the relatively small size of most burns (i.e., typically five acres or less), there would be no guarantee that smoke from every prescribed burn would behave as predicted and that people, including sensitive receptors, would not be exposed to odorous smoke. Therefore, prescribed burns implemented under the Plan would have the potential to expose receptors to odorous smoke emissions, possibly resulting in adverse reactions in sensitive receptors. Therefore, this impact would be **significant**.

As discussed in Section 3.3.1, "Environmental Setting," wildfires are a large source of smoke, and represent a greater odor source because of their uncontrolled nature, higher level of fuel consumption, and longer duration. Wildfires may last for days or weeks, potentially resulting in a longer exposure of receptors to objectionable odors from smoke. Most critically, wildfires often burn structures in addition to vegetation, releasing a wider array of odorous emissions from the burning of materials not present in prescribed burns that only combust vegetation. As described in Chapter 2, "Project Description," a primary purpose of the WVFMP is to reduce the occurrence and severity of wildfire in the Plan Area. However, given the unpredictability of wildfire, evaluating the net effect of the Plan on odor exposure associated with wildfire smoke is not possible, nor is it pertinent to determining the significance of short-term exposure to smoke-related odors under CEQA.

<u>Identified Treatment Projects (Project-level Analysis)</u>

None of the Identified Treatment Projects would involve the use of prescribed burning. Therefore, **no impact** would occur.

Mitigation Measures

Mitigation Measure AQ-2: Prevent and Minimize Smoke Emissions and Alert the Public of Upcoming Prescribed Burns

<u>Significance after Mitigation</u>

Considering that actions taken by the public to reduce exposure to odors from prescribed burns would be voluntary, there are no feasible additional methods available to compel the public to reduce its exposure. Although all feasible precautions and notifications are included in EPM AQ-1 and EPM AD-3, the potential remains that short-term exposure to odorous smoke emissions from unpredictable weather changes could occur. Therefore, this impact would be **significant and unavoidable**.

3.4 ARCHAEOLOGICAL, HISTORICAL, AND TRIBAL CULTURAL RESOURCES

This section evaluates the potential impacts related to implementation of the WVFMP on known and unknown cultural resources. Cultural resources include districts, sites, buildings, structures, or objects generally older than 50 years and considered to be important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. They include prehistoric resources, historic-era resources, unique archaeological resources (as defined by Public Resources Code [PRC] Section 21083.2[g]), and "tribal cultural resources" (as defined by Assembly Bill [AB] 52, Statutes of 2014, in PRC Section 21074).

Archaeological resources are locations where human activity has altered the earth or left deposits of prehistoric or historic-era physical remains (e.g., stone tools, bottles, former roads, foundations). Historical (or architectural) resources include standing buildings (e.g., houses, barns, outbuildings, cabins), intact structures (e.g., dams, bridges, roads, districts), and landscapes. A cultural landscape is defined as a geographic area (including both cultural and natural resources and the wildlife therein), associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values. Tribal cultural resources include site features, places, cultural landscapes, sacred places or objects that are of cultural value to a tribe and that meet the criteria described in PRC Section 21074.

Comments on the Notice of Preparation (NOP) related to archaeological, historical, and tribal cultural resources included requests to consider cultural resources and tribal cultural resources; consult with Native American Tribes; and consider the contribution of mature trees to the campus history. Refer to Appendix D for a summary of comments received on the NOP. These are addressed in Sections 3.4.1 through 3.4.3 below.

3.4.1 Environmental Setting

Information for this section was taken from the *Cultural Resources Sensitivity Analysis for the University of California, Berkeley Wildland Vegetative Fuel Management Plan, University of California, Berkeley Hill Campus, Alameda and Contra Costa Counties, California* (Cultural Resources Sensitivity Analysis) (UC Berkeley 2020).

PREHISTORY

Many early archaeological studies in the San Francisco Bay Area focused on shell middens, which were more common along the margins of the San Francisco Bay than in any other part of the state. Through archaeological explorations, these shell middens have provided considerable information about the early occupation of the region. The important type sites for major periods in Bay Area prehistory include four East Bay shellmound sites: CA-CC0-295 (Ellis Landing), CA-ALA-307 (West Berkeley), CA-ALA-309 (Emeryville), and CA-ALA-328 (Patterson).

Before 5,500-4,500 years ago, Native American occupation of California's Central Coast appears to have been intermittent and sparse. The lack of substantial evidence for early occupation along the bay shore may be related to rising sea levels submerging sites and sedimentation burying sites as the infilling of the bay's marshland occurred over the last 7,000 years. Native American occupation sites appear to have been selected for their accessibility, protection from seasonal flooding, and proximity to abundant and easily obtained resources. Early groups, similar to those that would come later, likely focused on hunting, gathering vegetal resources, and procuring shellfish. A general chronological framework for Central California prehistory identifies an Early Period dating from 7,000-2,500 BP, a Middle Period spanning 2,500-1,300 BP, and a Late Period dating from 1,300 BP to AD 1,800.

Archaeological evidence suggests an increase in occupation over time, with a correlation between permanent settlements and larger populations in later periods within the Central Coast region. Changes in subsistence strategies from Early Period hunting and gathering to permanent, settled Late Period villages can be traced to improvements in food storage technology, a focus on staple food exploitation, and an increase in socio-political complexity as evidenced through long-distance trade networks. The general pattern shows that coastal sites were focused on gathering and processing, while village locations were typically sited further inland. Middle Period sites appear to have been abandoned rather than continuously occupied as populations increased and became more dispersed during the Late Period.

The initial Central California Taxonomic System (CCTS) defined a framework for relationships between cultural chronological sequences and the various environmental zones found in the California landscape. Three main phases were identified representing culture change over time within the San Francisco Bay Area: the Ellis Landing phase, representing the CCTS Middle Horizon; the Emeryville phase, representing Phase 1 of the Late Horizon; and the Fernandez phase (based on CA-CCO-259), representing Phase 2 of the Late Horizon. The earlier concept of a chronological taxonomic framework was then expanded to divide California prehistory into major cultural periods representing distinctive social, technological, and material "patterns" that consisted of separate, coexisting cultures with similar cultural traits that existed across multiple regions. Fredrickson also adopted the spatially defined units (from smallest to largest) of site, locality, district, and region. The Alameda district encompasses the Plan Area. Several prehistoric sites identified in the Alameda district include CA-ALA-566 (5,275 cal. BP) and CA-ALA-555 (300 BP). These sites' cultural elements represent the Lower Berkeley, Upper Berkeley, and Augustine patterns.

ETHNOGRAPHY

The Plan Area falls within the traditional territory of the Ohlone, also known linguistically as the Costanoan. Costanoan is a member of the Utian language family. Eight branches of Costanoan speaking peoples inhabited the greater San Francisco Bay Area. Before the arrival of Europeans to the San Francisco Bay Area, Ohlone territory extended as far east as Livermore, southeast to Soledad, southwest to a point approximately 30 miles south of the Monterey Bay, and north to the Golden Gate. The entire frontage of the bay was lined with large shellmounds. Ohlone settlements were built along the coastal shoreline, bays, estuaries, and along perennial and intermittent inland drainages. Land that is currently within City of Berkeley limits was occupied by the Chochenyo or Huchiun band of Ohlone at the time of contact, and a village site (*Huchiu-n*) was identified north of Oakland, possibly in the Emeryville area.

The Chochenyo/Huchiun, similar to other San Francisco Bay area tribes, occupied small territories of land that ranged from approximately 8 to 12 miles wide. When Spanish explorers initially passed through the East Bay, they observed villages that averaged 60 to 90 people spaced roughly 3 to 5 miles apart.

A number of intermarried families that made up a small autonomous polity lived within each tribal territory. Members of the local groups hosted dances, pooled their labor during short harvest periods, defended their territory, and resolved internal disputes under the leadership of a headman. In some areas of California, the families of a tribe shared a single central village location for much of the year, however, Bay Area tribes lived most of the year in a more dispersed pattern.

The Ohlone subsistence economy revolved around fishing, hunting, and gathering of locally available resources. Local Native people made use of a wide array of terrestrial and marine resources. Shellfish played an important role in the Ohlone diet, and various fishes—including nearshore, anadromous, and freshwater species—were caught. Waterfowl, inland birds, and terrestrial mammals, such as elk, deer, and rabbits also, were hunted and eaten. Many plants were collected by Ohlone people from diverse habitats. Nuts, berries, roots, and other plants were available for harvest as well as acorns, which were a staple food in late pre-contact times.

A pre-contact population estimate for the Ohlone was 10,000 persons. Populations were decimated by contact with the Spanish, as European diseases caused high death rates among California Natives. Recruitment by the missions and the relocation or break-up of the villages and tribelets separated families and forced communities to outwardly abandon their social traditions, customs, and rituals. During the Mexican Period, Native people were forced into the missions and, after the missions were dissolved, were often relocated to labor on local *ranchos*.

HISTORIC SETTING

Gasper de Portolá and his party were the first Spanish explorers to visit the San Francisco Bay Area in 1769. Captain Juan Bautista de Anza later visited the San Francisco Bay Area in 1776. The bay inlet was valued by the Spanish as a strategically important harbor and an important location to establish a *presidio*, known as the San Francisco Presidio. On a creek, a few miles southeast of the *presidio*, Mission San Francisco de Asís (currently Mission Delores) was established in 1776. This led to the construction of other missions around the San Francisco Bay, including Santa Clara de Asís in 1777 and San José in 1797. The Spanish government allotted the individual missions large, expansive tracts of land. They were managed by the mission fathers for the duration of the Mission Period that lasted from 1776 to the early 1830s. The missions supported large herds of cattle that were used to produce food, hides, and tallow. Local and non-local California Natives were rounded up to provide a labor force for the missions. Life was not easy for these Native people. They were taken from their homes and converted to Christianity. They were not allowed to practice their own customs and traditions or to speak their language. Exposure to previously unknown diseases was devastating for Native communities and became the primary source of death and decline for these Native neophytes. After 1822, under Mexican rule, the Native population continued to decline.

During the Mission Period, before secularization, only three large land grants were awarded by the Spanish government for the five counties that included present-day Alameda, San Francisco, Contra Costa, Santa Cruz, and Santa Clara. The mission system continued under Mexican rule until 1833, when the Secularization Act was passed. Under that law, mission ownership was withdrawn from the Catholic Church and land grants, or *ranchos*, were distributed to prominent, wealthy Mexican families or as a reward to soldiers for their service during the revolt against the Spanish.

In 1820, Sergeant Luis María Peralta received a large landholding allotment before secularization. This large land grant was called *Rancho San Antonio*. It spanned 43,000 acres and encompassed all of present-day Alameda, Oakland, Albany, Berkeley, Emeryville, Piedmont, and part of San Leandro. Peralta later divided the land between his four sons. What is now the City of Berkeley lies mostly in the portion that went to Peralta's son Domingo, with some in the portion that went to another son, Vicente. The *rancho* was devoted largely to raising cattle for meat and hides but hunting and farming also were pursued. The *Rancho San Antonio* adobe headquarters has been a City of Oakland Landmark site since 1975. None of the Peralta adobes are located in or near the Plan Area.

The *rancho* system persisted until the end of the Mexican-American War in 1848 when Mexico ceded California to the United States with the Treaty of Guadalupe Hidalgo. The discovery of gold on the American River 50 miles east of Sacramento in 1848 started the first chapter of the Gold Rush and hastened growth and development elsewhere in California. Some towns, like Sacramento and San Francisco, became boom cities as a result of the stampede to find gold. As American Period settlement began in the late 1840s, the influx of settlers led to an increase in agricultural activity. The discovery of gold also resulted in the establishment of new transportation corridors throughout the San Francisco Bay Area. As traffic inland increased, enterprising individuals established towns along various routes to provide food, shelter, and other necessities to the settlers.

California was admitted as a state in 1850 and initially divided into 27 counties. Alameda County was created in 1853 from portions of Contra Costa and Santa Clara Counties. In 1851, a Land Commission was established to verify ownership claims of the *ranchos*. In many cases, ownership of *ranchos* was deemed invalid, which opened large tracts of land for purchase by Americans. Before the American Period, there were few Euro-American settlers in the vicinity, and available land appears to have been abundant. The area that became the City of Berkeley was the northern part of the Oakland Township subdivision of Alameda County. During this period, the area consisted mostly of open lands, farms, and ranches with a small, active wharf on the bay.

In 1866, the College of California was established at the base of the Berkeley Hills to either side of Strawberry Creek. The college site and ultimately the city were named after the Anglican bishop and philosopher George Berkeley. The college raised funds for the new campus by selling off adjacent land parcels and laid out a plat and street grid that became the city's modern street plan. The college failed to raise the requisite funds and began a collaboration with the state of California that resulted in the creation of the University of California in 1868. The University of California, Berkeley was thus the first in the 10-campus system to be established.

Residential and industrial buildings grew up around the campus. The Transcontinental Railroad had reached Oakland by the 1870s. In 1876, the Berkeley Branch Railroad, an offshoot of the Central Pacific Railroad, was extended from the mainline into downtown Berkeley. In 1878, the area around the campus extending to the wharf, then known as Ocean View, were incorporated as the Town of Berkeley. Electric lights and streetcars appeared in the Town of Berkeley by 1888. The town was spared serious damage in the 1906 earthquake, though many San Francisco residents displaced by the quake flowed into Berkeley. In 1909, with its burgeoning population, the town became the City of Berkeley. The city continued to grow, particularly during World War II as people moved to the Bay Area to work in the local shipyards. The Lawrence Berkeley National Laboratory, established in 1931, was relocated from UC Berkeley's Campus Park to the Hill Campus to accommodate its need for growth. Following the war, industrial growth slowed somewhat though the university continued to expand, as did the Hill Campus. The Lawrence Hall of Science, Space Sciences Laboratory, and Mathematical Sciences Research Institute were established within the Hill Campus, along with the Botanical Garden, Strawberry Canyon Recreation Area and the Witter and Levine-Fricke sport fields.

Historic Resources Known to UC Berkeley

In the UC Berkeley 2020 LRDP EIR (UC Berkeley 2004), historic resources are divided into two categories: Primary Historical Resources and Secondary Historical Resources. Primary Historical Resources include those listed on the California Register of Historic Resources (CRHR). Secondary Historical Resources include resources listed on local registers, as well as resources eligible for listing on the state inventory. Secondary Historical Resources are presumed significant unless a preponderance of evidence demonstrates otherwise.

Several buildings and structures at UC Berkeley are considered Primary or Secondary Historical Resources, such as the Hearst Greek Theatre and California Memorial Stadium (UC Berkeley 2004). Two Secondary Historical Resources have been identified within the Plan Area: the Big "C" on Charter Hill built in 1905 on the hillside above the California Memorial Stadium and the Botanical Garden, which was constructed in 1920 through 1926 (UC Berkeley 2004:4.4-30).

In addition to the historic resources located on UC Berkeley property, a historic district is located adjacent to the Hill Campus, south and southwest of the Plan Area. This historic district is known as the Panoramic Hill Historic District, which was listed on the National Register of Historic Places (NRHP) in 2005 under Criterion C. It is described as a woodsy, hillside residential neighborhood consisting primarily of single-family detached houses built from 1901 through the 1940s in various stages of the Bay Area Tradition (NPS 2005).

RECORDS SEARCHES, SURVEYS, AND CONSULTATION

A confidential records search for the Plan Area and a 0.25-mile buffer was conducted by Pacific Legacy, Inc. at the Northwest Information Center (NWIC) on December 10, 2019 (IC File No. 19-0848). The search included a review of the Historic Properties Directory, NRHP, CRHR, California State Historical Landmarks, California Inventory of Historic Resources, California Points of Historical Interest, Archaeological Determinations of Eligibility, records of previously recorded cultural resources, and records of previous field studies.

The records search revealed nine previous archaeological reports overlapping with the Plan Area and 12 additional reports within 0.25 mile of the Plan Area. Three archaeological (prehistoric) resources were identified within the Plan Area and 19 have been recorded outside of the Plan Area but within a surrounding 0.25-mile radius. Of the 19 resources recorded outside of the Plan Area, four are prehistoric, including two burial sites, one possible midden site, and one isolated prehistoric lithic artifact. The 15 historic period sites outside of the Plan Area include the Charles Lee Tilden Regional Park, an amusement park, two fence segments, two single family properties, one industrial property, two educational buildings, two ancillary buildings, two building foundations, a debris pit, two water conveyance systems, and one military property. The three archaeological resources that have been identified within the Plan Area are described below.

Known Prehistoric Archaeological Resources within the Plan Area

The three archaeological resources recorded within the Plan Area include the following:

- Isolated find P-01-010575, which was recorded in 2002 as an obsidian projectile point fragment.

- Site P-01-10576 was recorded in 2002 as a cluster of boulders featuring numerous incised designs, including "about five locations of Western Messenger motief petroglyphs."
- Site P-01-000039 was first recorded by Pilling in 1950 as "a petroglyph site of almost certain Western origin, but one that shows some signs of fairly ancient origin (ca. 75 yrs.) in the form of lichen." At the time, Pilling suspected that the designs dated to the historic period. Based on a newspaper chronicle of the site, it was thought that hand imprints might be prehistoric, but an incision of a swastika and a possible date indicated that it was likely historic.

The resource record for P-01-010575 notes that the artifact was collected at the time it was recorded, and the other two resources are outside of the project areas for the Identified Treatment Projects.

Tribal Cultural Resources

Tribal Consultation

In compliance with PRC Sections 21080.3.1 and 21080.3.2, UC Berkeley sent letters to three Native American Tribes on October 24, 2019 (Table 3.4-1). The Northern Valley Yokuts Tribe was the only tribe that responded within the 30-day period required by PRC Section 21080.3.1(b), which closed on November 24, 2019. The Northern Valley Yokuts Tribe responded on November 18, 2019, requesting consultation, requesting a site visit, and asking to be notified if there were any unanticipated discoveries during construction. UC Berkeley responded on December 9, 2019, commencing consultation, and provided a copy of the Cultural Resources Sensitivity Analysis to the tribe on February 27, 2020. UC Berkeley followed up via email on March 9, 2020; June 17, 2020; June 22, 2020; June 29, 2020; and July 6, 2020; and by phone on June 25, 2020; July 1, 2020; and July 6, 2020. The Northern Valley Yokuts Tribe responded to UC Berkeley in July and both parties are in the process of scheduling a site visit to the Plan Area as part of consultation. Consultation with the Northern Valley Yokuts Tribe is ongoing.

Table 3.4-1 Tribal Consultation in Compliance with PRC Section 21080

Native American Tribe and Contact	Letters Sent to Tribes	Date of Initial Response from Tribe	Follow-up Response	Comment
The Ohlone Indian Tribe Andrew A. Galvan	October 24, 2019	No response	N/A	Consultation concluded.
The Karuk Tribe Alex R. Watts-Tobin	October 24, 2019	No response	N/A	Consultation concluded.
Northern Valley Yokuts Tribe Katherine Erolinda Perez	October 24, 2019	November 18, 2019	December 9, 2018	The Tribe requested consultation, review of environmental documents, and a site visit.

Source: Data compiled by Ascent Environmental in 2020

The California Native American Heritage Commission (NAHC) was contacted on November 18, 2019, to request a search of its Sacred Lands database and a list of contact information for local Native American representatives geographically affiliated with the Plan Area. A response was received from the NAHC on November 25, 2019, that a search of the Sacred Lands File was positive for the Plan Area and that the North Valley Yokuts Tribe should be contacted for further information. The NAHC also provided a list of eight tribal representatives who may have knowledge of cultural resources in the Plan Area. In addition to consultation conducted under PRC Section 21080.3.1(b), certified letters were sent to each of these tribal representatives regarding the WVFMP requesting any information they may have on Native American cultural resources or sensitive areas within or near the Plan Area.

Pacific Legacy received responses from two Native American tribal groups. Wilton Rancheria responded on December 19, 2019, asking to participate in activities, and requesting consultation. The Northern Valley Yokuts Tribe responded on December 1, 2019, requesting consultation pursuant to PRC Sections 21080.3.1 and 21080.3.2 and requesting information about the WVFMP. The Northern Valley Yokuts Tribe also requested further participation if tribal cultural resources are identified within the Plan Area and proposed mitigation and protection measures if resources are identified. As described above, consultation with the Northern Valley Yokuts Tribe is ongoing pursuant to PRC Sections 21080.3.1 and 21080.3.2. Coordination with Wilton Rancheria is also continuing outside of the PRC Section 21080 process.

3.4.2 Regulatory Setting

The regulations identified below are applicable at the program and project level.

FEDERAL

Section 106 of the National Historic Preservation Act

Federal protection of resources is legislated by (a) the National Historic Preservation Act (NHPA) of 1966 as amended by 16 U.S. Code 470, (b) the Archaeological Resource Protection Act of 1979, and (c) the Advisory Council on Historical Preservation. These laws and organizations maintain processes for determination of the effects on historical properties eligible for listing in the NRHP. Compliance with these federal requirements would only be relevant, if a federal agency permit or approval were needed to implement a project, such as a Clean Water Act Section 404 permit.

Section 106 of the NHPA and accompanying regulations (36 Code of Federal Regulations [CFR] Part 800) constitute the main federal regulatory framework guiding cultural resources investigations and require consideration of effects on properties that are listed in or may be eligible for listing in the NRHP. The NRHP is the nation's master inventory of known historical resources.

The formal criteria (36 CFR 60.4) for determining NRHP eligibility are as follows:

1. The property is at least 50 years old (however, properties under 50 years of age that are of exceptional importance or are contributors to an historic district can also be included in the NRHP);
2. It retains integrity of location, design, setting, materials, workmanship, feeling, and associations; and
3. It possesses at least one of the following characteristics:

   Criterion A Association with events that have made a significant contribution to the broad patterns of history (events).

   Criterion B Association with the lives of persons significant in the past (persons).

   Criterion C Distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant, distinguishable entity whose components may lack individual distinction (architecture).

   Criterion D Has yielded, or may be likely to yield, information important to prehistory or history (information potential).

The National Register Bulletin also provides guidance in the evaluation of archaeological site significance. Effects of a project on properties listed in the NRHP must be evaluated under CEQA; therefore, potential effects on historical resources are evaluated below. Section 106 of the NHPA would apply to the WVFMP if a treatment project uses federal funds or requires a federal permit.

STATE

California Register of Historical Resources

All properties in California that are listed in or formally determined eligible for listing in the NRHP are eligible for the CRHR. The CRHR is a listing of state resources that are significant within the context of California's history. The CRHR is a statewide program of similar scope and with similar criteria for inclusion as those used for the NRHP. In addition, properties designated under municipal or county ordinances are also eligible for listing in the CRHR.

An historical resource must be significant at the local, state, or national level under one or more of the criteria defined in the California Code of Regulations Title 15, Chapter 11.5, Section 4850, to be included in the CRHR. The CRHR criteria are similar to the NRHP criteria and are tied to CEQA because any resource that meets the criteria below is considered a significant historical resource under CEQA. As noted above, all resources listed in or formally determined eligible for the NRHP are automatically listed in the CRHR.

The CRHR uses four evaluation criteria:

1. Is associated with events or patterns of events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States.
2. Is associated with the lives of persons important to local, California, or national history.
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master, or possesses high artistic values.
4. Has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California or the nation.

Similar to the NRHP, a resource must meet one of the above criteria and retain integrity. The CRHR uses the same seven aspects of integrity as the NRHP. The CRHR would apply to the WVFMP if a treatment project has the potential to affect a historical resource.

California Environmental Quality Act

CEQA requires public agencies to consider the effects of their actions on "historical resources," "unique archaeological resources," and "tribal cultural resources."

Historical Resources

"Historical resource" is a term with a defined statutory meaning (PRC Section 21084.1; determining significant impacts to historical and archaeological resources is described in the State CEQA Guidelines, Sections 15064.5[a] and [b]). Under State CEQA Guidelines Section 15064.5(a), historical resources include the following:

1. A resource listed in or determined to be eligible by the State Historical Resources Commission, for listing in the California Register of Historical Resources (PRC Section 5024.1).
2. A resource included in a local register of historical resources, as defined in Section 5020.1(k) of the Public Resources Code or identified as significant in an historical resource survey meeting the requirements of Section 5024.1(g) of the Public Resources Code, will be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3. Any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be an historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource will be considered by the lead agency to be historically significant if the resource meets the criteria for listing in the California Register of Historical Resources (PRC Section 5024.1).
4. The fact that a resource is not listed in or determined to be eligible for listing in the California Register of Historical Resources, not included in a local register of historical resources (pursuant to Section 5020.1(k) of the Public Resources Code), or identified in an historical resources survey (meeting the criteria in Section 5024.1(g) of the Public Resources Code) does not preclude a lead agency from determining that the resource may be an historical resource as defined in PRC Section 5020.1(j) or 5024.1.

Under PRC Section 21084.1 and State CEQA Guidelines Section 15064.5(b), a substantial adverse change in the significance of an historical resource is a significant environmental effect. State CEQA Guidelines Section 15126.4(b) includes the following considerations for mitigation related to significant effects on historical resources.

1. Where maintenance, repair, stabilization, rehabilitation, restoration, preservation, conservation or reconstruction of the historical resource will be conducted in a manner consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings (1995), Weeks and Grimmer, the project's impact on the historical resource will generally be considered mitigated below a level of significance and thus is not significant.

2. In some circumstances, documentation of an historical resource, by way of historic narrative, photographs or architectural drawings, as mitigation for the effects of demolition of the resource will not mitigate the effects to a point where clearly no significant effect on the environment would occur.
3. Public agencies should, whenever feasible, seek to avoid damaging effects on any historical resource of an archaeological nature. The following factors will be considered and discussed in an EIR for a project involving such an archaeological site:
   A. Preservation in place is the preferred manner of mitigating impacts to archaeological sites. Preservation in place maintains the relationship between artifacts and the archaeological context. Preservation may also avoid conflict with religious or cultural values of groups associated with the site.
   B. Preservation in place may be accomplished by, but is not limited to, the following:
      1. Planning construction to avoid archaeological sites;
      2. Incorporation of sites within parks, greenspace, or other open space;
      3. Covering the archaeological sites with a layer of chemically stable soil before building tennis courts, parking lots, or similar facilities on the site.
      4. Deeding the site into a permanent conservation easement.
   C. When data recovery through excavation is the only feasible mitigation, a data recovery plan, which makes provisions for adequately recovering the scientifically consequential information from and about the historical resource, will be prepared and adopted before any excavation being undertaken. Such studies will be deposited with the California Historical Resources Regional Information Center. Archaeological sites known to contain human remains will be treated in accordance with the provisions of Section 7050.5 Health and Safety Code. If an artifact must be removed during project excavation or testing, curation may be an appropriate mitigation.
   D. Data recovery will not be required for an historical resource if the lead agency determines that testing or studies already completed have adequately recovered the scientifically consequential information from and about the archaeological or historical resource, provided that the determination is documented in the EIR and that the studies are deposited with the California Historical Resources Regional Information Center.

These provisions of CEQA would apply to the WVFMP if a treatment project has the potential to affect a historical resource.

Unique Archaeological Resources

CEQA also requires lead agencies to consider whether projects will impact unique archaeological resources. PRC Section 21083.2(g) states that unique archaeological resource means an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

As discussed in Sections 21083.2(a) and (h), non-unique archaeological resources not meeting any of these criteria do not require further protection.

Section 21083.2(b) states that if it can be demonstrated that a project will cause damage to a unique archaeological resource, the lead agency may require reasonable efforts be made to preserve the resources in place or left in an undisturbed state. Examples of that treatment, in no order of preference, may include, but are not limited to, any of the following:

1. Planning construction to avoid archaeological sites.
2. Deeding archaeological sites into permanent conservation easements.
3. Capping or covering archaeological sites with a layer of soil before building on the sites.
4. Planning parks, greenspace, or other open space to incorporate archaeological sites.

Subdivision (d) further states that excavation as mitigation will be restricted to those parts of the unique archaeological resource that would be damaged or destroyed by the project.

These provisions of CEQA would apply to the WVFMP if a treatment project has the potential to affect an unique archaeological resource.

Tribal Cultural Resources

CEQA also requires lead agencies to consider whether projects will impact tribal cultural resources (TCRs). PRC Section 21074 states the following:

a. "Tribal cultural resources" are either of the following:
    1. Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either of the following:
        A. Included or determined to be eligible for inclusion in the California Register of Historical Resources.
        B. Included in a local register of historical resources as defined in Section 5020.1(k).
    2. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in Section 5024.1(c). In applying the criteria set forth in Section 5024.1(c) for the purposes of this paragraph, the lead agency will consider the significance of the resource to a California Native American tribe.

b. A cultural landscape that meets the criteria of Section 21084.1(a) is a tribal cultural resource to the extent that the landscape is geographically defined in terms of the size and scope of the landscape.

c. An historical resource described in Section 21084.1, a unique archaeological resource as defined in Section 21083.2(g), or a "nonunique archaeological resource" as defined in Section 21083.2(h) may also be a tribal cultural resource if it conforms with the criteria of Section 21084.1(a).

PRC Section 21084.2 states that a substantial adverse change in the significance of a tribal cultural resource is a significant environmental effect.

These provisions of CEQA would apply to the WVFMP if a treatment project has the potential to affect a tribal cultural resource.

California Native American Historical, Cultural, and Sacred Sites Act

The California Native American Historical, Cultural, and Sacred Sites Act applies to both state and private lands. The Act requires that upon discovery of human remains, construction or excavation activity cease and the County coroner be notified. If the remains are of a Native American, the coroner must notify NAHC, which notifies and has the authority to designate the most likely descendant (MLD) of the deceased. The Act stipulates the procedures the descendants may follow for treating or disposing of the remains and associated grave goods. This Act would apply to the WVFMP if a treatment project encounters human remains.

Health and Safety Code, Sections 7050.5 and 7052

Section 7050.5 of the Health and Safety Code requires that construction or excavation be stopped in the vicinity of discovered human remains until the coroner can determine whether the remains are those of a Native American. If determined to be Native American, the coroner must contact the NAHC. Section 7052 states that the disturbance of Native American cemeteries is a felony. This regulation would apply to the WVFMP if a treatment project encounters human remains.

Public Resources Code, Section 5097

PRC Section 5097 specifies the procedures to be followed in the event of the unexpected discovery of human remains on nonfederal land. The disposition of Native American burial falls within the jurisdiction of the NAHC. Section 5097.5 of the Code states the following:

> No person will knowingly and willfully excavate upon, or remove, destroy, injure, or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor.

This regulation would apply to the WVFMP if a treatment project encounters human remains.

Public Resources Code, Section 21080.3

Assembly Bill 52, signed by the California Governor in September of 2014, established a new class of resources under CEQA: "tribal cultural resources," defined in PRC 21074. Pursuant to PRC Sections 21080.3.1 and 21080.3.2, lead agencies undertaking CEQA review must, upon written request of a California Native American tribe, begin consultation before the release of an environmental impact report, negative declaration, or mitigated negative declaration. PRC Section 21080.3.2 states:

> Within 14 days of determining that a project application is complete, or to undertake a project, the lead agency must provide formal notification, in writing, to the tribes that have requested notification of proposed projects in the lead agency's jurisdiction. If it wishes to engage in consultation on the project, the tribe must respond to the lead agency within 30 days of receipt of the formal notification. The lead agency must begin the consultation process with the tribes that have requested consultation within 30 days of receiving the request for consultation. Consultation concludes when either: 1) the parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource, or 2) a party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached.

If the lead agency determines that a project may cause a substantial adverse change to a tribal cultural resource, and measures are not otherwise identified in the consultation process, provisions under PRC Section 21084.3(b) describe mitigation measures that may avoid or minimize the significant adverse impacts. PRC Sections 21080.3.1 and 21080.3.2 apply to the WVFMP because UC Berkeley is undertaking CEQA review for this proposed Plan.

LOCAL

As a constitutionally-created state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies. Following the relevant policies of the UC Berkeley 2020 LRDP, relevant local regulations are summarized below. The Open Space and Scenic Elements of the Alameda County General Plan do not contain principles or objectives related to cultural resources that are applicable to the WVFMP.

UC Berkeley 2020 LRDP

The UC Berkeley 2020 LRDP contains the following objective related to historical resources that is applicable to the WVFMP (UC Berkeley 2005):

- Maintain and enhance the image and experience of the campus, and preserve our historic legacy of landscape and architecture.

Contra Costa County General Plan

The Open Space Element of the Contra Costa County General Plan contains the following policies related to cultural resources that are applicable to the WVFMP (Contra Costa County 2010):

- Policy 9-28. Areas which have identifiable and important archaeological or historic significance will be preserved for such uses, preferably in public ownership.
- Policy 9-29. Buildings or structures that have visual merit and historic value will be protected.

City of Berkeley General Plan

The City of Berkeley Urban Design & Preservation Element contains the following policies related to cultural resources that are applicable to the WVFMP (City of Berkeley 2003):

- Policy UD-1 Techniques. Use a wide variety of regulatory, incentive, and outreach techniques to suitably protect Berkeley's existing built environment and cultural heritage.
- Policy UD-9 Trees. Wherever feasible and appropriate, tree replacement should emphasize maintaining historic planting patterns and native species and be consistent with the City of Berkeley 1990 Street Tree Policy or subsequent tree policies.

City of Oakland General Plan

The Historic Preservation Element of the City of Oakland General Plan contains the following goal related to cultural resources that is applicable to the WVFMP (City of Oakland 2004):

- Goal 2. To preserve, protect, enhance, perpetuate, use, and prevent the unnecessary destruction or impairment of properties or physical features of special character or special historic, cultural, educational, architectural or aesthetic interest or value.

3.4.3 Impacts Analysis and Mitigation Measures

ANALYSIS METHODOLOGY

The impact analysis considers the known historical, archaeological, and tribal cultural resource environmental setting in the Plan Area, as well as the potential for previously undocumented resources, including human remains, and physical effects (i.e., disturbance, material alteration, demolition) to known and previously undocumented cultural resources that could result from implementation of the WVFMP. The impact analysis for archaeological, historical, and tribal cultural resources is based on the findings and recommendations of *Cultural Resources Sensitivity Analysis for the University of California, Berkeley Wildland Vegetative Fuel Management Plan, University of California, Berkeley Hill Campus, Alameda and Contra Costa Counties, California* (UC Berkeley 2020). The analysis is also informed by the provisions and requirements of federal, state, and local laws and regulations that apply to cultural resources.

SIGNIFICANCE CRITERIA

An impact on archaeological, historical, or tribal cultural resources is considered significant if implementation of the WVFMP would:

- cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5 of the State CEQA Guidelines;
- cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5 of the State CEQA Guidelines;
- cause a substantial adverse change in the significance of a tribal cultural resource, defined in PRC Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe; or
- disturb any human remains, including those interred outside of formal cemeteries.

ISSUES NOT EVALUATED FURTHER

There are two Secondary Historical Resources located within the Plan Area, the "Big C" and the Botanical Garden, and additional known historic resources located adjacent to the Plan Area: the California Memorial Stadium and the Panoramic Hill Historic District. Implementation of vegetation treatments under the Plan would not remove or modify any structures and no vegetation treatments would occur in the area directly around the "Big C" or within the Botanical Garden. In addition, proposed vegetation treatments under the WVFMP would not demolish, destroy, relocate, or alter any portion of the historic resources located adjacent to the Plan Area such that they would be "materially impaired," including the California Memorial Stadium and the Panoramic Hill Historic District. Material impairment of a historical resource occurs when a project "alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the CRHR." CEQA Guidelines Section 15064.5(b)(2). With implementation of the WVFMP, adjacent historic resources such as the Memorial Stadium and the Panoramic Hill Historic District would retain all major character-defining features that qualify them for inclusion in the NRHP and CRHR. Specifically, the critical relationship of the Panoramic Hill Historic District's built environment and the natural setting would not be disrupted or diminished by vegetation treatment activities that would occur under the WVFMP within the Plan Area, and it would continue to maintain requisite integrity to remain significant under NRHP/CRHR Criterion C/3 as a woodsy, hillside residential neighborhood that represents the Bay Area Tradition in architecture. Furthermore, although the WVFMP would include tree removal, none of the trees proposed for removal have been identified as historic resources and because the Plan Area has not been defined as a cultural landscape, the existing trees are not resources that contribute to a cultural landscape. Therefore, the potential for WVFMP implementation, including the Identified Treatment Projects, to adversely affect known historic resources with and adjacent to the Plan Area is not evaluated further. The potential for implementation of the WVFMP to adversely affect subsurface historical resources is discussed under Impact CUL-1 below.

IMPACTS ANALYSIS

Impact CUL-1: Cause a Substantial Adverse Change in the Significance of Unique Archaeological Resources or Subsurface Historical Resources

Three archaeological resources have been recorded within the Plan Area. In addition, it is possible that unique archaeological or subsurface historical resources would be disturbed during treatment activities. Treatment activities that require soil disturbance or prescribed burning have the potential to encounter unknown unique archaeological resources or subsurface historical resources, which could be inadvertently damaged during treatment activities. This would be a **significant** impact for the overall WVFMP as well as the Identified Treatment Projects.

Overall WVFMP

As discussed above, three archaeological (prehistoric) resources have been recorded in the Plan Area including a projectile point (P-01-010575), single stone pestle (P-01-10576), and petroglyph (CA-Ala-19/P-01-000039). Implementation of vegetation treatments under the Plan would not affect these archaeological resources because they have either been previously removed or their locations are known and would be identified and avoided during treatment activities. However, there are areas of moderate to high sensitivity for buried cultural resources within and adjacent to the Plan Area that could contain unknown resources. Under the WVFMP, UC Berkeley would implement vegetation treatment activities as described in Chapter 2, "Project Description;" those activities with the potential to affect cultural resources are analyzed in the sections that follow. Herbicide application would not have the potential to inadvertently damage a cultural resource because activities would be limited to the use of herbicides to kill or remove the above-ground portions of vegetation in the Plan Area.

Manual Vegetation Treatment

Manual treatments have the potential to inadvertently damage a unique archaeological resource or subsurface historical resource because use of hand tools and hand-operated power tools could result in minor ground disturbance during vegetation removal. While ground disturbance associated with this treatment activity would be minimal and would typically be less than mechanical treatments, manually pulling, grubbing, or digging out root systems could cause ground disturbance that could inadvertently damage an unknown cultural resource.

Mechanical Vegetation Treatment

Mechanical treatments have the highest potential to inadvertently damage a unique archaeological resource or subsurface historical resource because this treatment activity would result in churning up the ground surface with equipment as vegetation is removed. These activities could unearth previously undiscovered archaeological resources or subsurface historical resources.

Prescribed Burning

If unknown cultural resources are present, prescribed burning (including pile burning) also has the potential to inadvertently damage surface-level archaeological resources by altering the geochemical properties from heat and fire or increasing their exposure to natural and cultural processes such as erosion or pedestrian traffic.

Managed Herbivory

Although managed herbivory is expected to result in minimal ground disturbance, livestock could alter or displace cultural materials or features, particularly when a herd of animals are set to graze within a confined area or when animal trails are created that can lead to soil displacement or erosion. Soil displacement or erosion could result in inadvertent damage to a unique archaeological resource or subsurface historical resource.

Therefore, ground disturbance or prescribed burning during treatments could expose unknown archaeological resources or subsurface historical resources, which may result in inadvertent damage to or destruction of these resources. If this occurred, it could cause a substantial adverse change in the significance of unique archaeological resources or subsurface historical resources, which would be a **significant** impact.

Identified Treatment Projects

As previously described above, three archaeological resources have been identified within the Plan Area; however, one was collected at the time it was recorded and the other two are outside of the project areas for the Identified Treatment Projects. Although no known resources would be affected by the Identified Treatment Projects, there is a potential for other unknown archaeological or subsurface historical resources to be located in Identified Treatment Project areas, which could be adversely affected during ground disturbing treatment activities. The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and herbicide application. Identified Treatment Projects would not include prescribed burning or managed herbivory. Similar to program-level treatments, use of herbicides are not expected to result in ground disturbance, but manual and mechanical treatments could result in ground disturbance during vegetation removal. Thus, the potential to unearth previously undiscovered archaeological or subsurface historical resources and inadvertently damage or destroy them would be the same as described above for the overall WVFMP and this impact would be **significant**.

Mitigation Measures

Mitigation Measure CUL-1a: Conduct Archaeological Surveys

Before conducting treatment activities that involve ground disturbance or prescribed burning in an area not previously surveyed for cultural resources (refer to Attachment A, Figure 3 of the Cultural Resources Sensitivity Analysis [UC Berkeley 2020] for surveyed areas), UC Berkeley will retain a qualified archaeologist to conduct a field survey for archaeological resources.

If archaeological resources are found during the field survey, the resources will be inventoried using appropriate state record forms and submitted to the NWIC. The resources will be evaluated for NRHP and CRHR significance. If the resources are found to be significant, appropriate measures will be identified by the qualified cultural resource specialist and Native American representatives, implemented at the direction of UC Berkeley, and documented in the project record. Appropriate measures to minimize impacts to significant resources could include avoidance, capping, or data recovery excavations of the finds. Fencing will be installed around any resources to be avoided including a buffer area. Justification will be included for any tribal recommendations that are not implemented. If identified resources cannot be avoided, an archaeological monitor will be present during any ground disturbance or prescribed burning in the vicinity of discovered resources. The monitoring period will be determined by the qualified cultural resource specialist. If the resource is determined to not be significant, or if no resources are present within the project site, no further mitigation would be required unless there is a discovery during a treatment activity. If additional archaeological resources are found during treatment activities, the procedures identified in Mitigation Measure CUL-1b for the discovery of unknown resources will be followed.

Mitigation Measure CUL-1b: Protect Inadvertent Discoveries of Unique Archaeological Resources or Subsurface Historical Resources

If any prehistoric or historic-era subsurface archaeological features or deposits, including locally darkened soil ("midden"), that could conceal cultural deposits, are discovered during treatment activities, all ground-disturbing activity and prescribed burning within 100 feet of the resource will be halted and a qualified cultural resource specialist will assess the significance of the find. If the find is determined to be significant by the qualified cultural resource specialist (i.e., because the find constitutes a unique archaeological resource, subsurface historical resource, or tribal cultural resource), the cultural resource specialist in consultation with Native American representatives will implement appropriate procedures such that the integrity of the resource is protected (i.e., the resource stays intact and complete) and ensure that no additional resources are affected. Procedures could include, but would not be limited to, preservation in place, archival research, subsurface testing, or contiguous block unit excavation and data recovery.

Mitigation Measure CUL-1c: Avoid and Protect Known Unique Archaeological Resources

For archaeological resources that are known or those that are identified during surveys conducted pursuant to Mitigation Measure CUL-1a, and have been determined by a qualified archaeologist to qualify as a unique archaeological resource, they will be appropriately marked and their locations communicated to workers to ensure protection and avoidance. Confidentiality of cultural resources sites will be maintained with minimal disclosure of site locations. If identified resources cannot be avoided, an archaeological monitor will be present during any ground disturbance or prescribed burning in the vicinity of discovered resources.

<u>Significance after Mitigation</u>

Implementation of Mitigation Measures CUL-1a through CUL-1c would reduce impacts from implementation of the overall WVFMP as well as the Identified Treatment Projects by requiring the performance of professionally-accepted and legally-compliant procedures for the discovery and protection of previously undiscovered significant archaeological resources. With implementation of these measures, there would be no inadvertent damage and resulting substantial adverse change in the significance of any unknown archaeological or subsurface historical resources; this impact would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects.

Impact CUL-2: Cause a Substantial Adverse Change in the Significance of a Tribal Cultural Resource

UC Berkeley sent letters to three Native American tribes notifying each that an EIR was being prepared under CEQA, as required by PRC 21080.3. One tribe requested the initiation of tribal consultation. Tribal consultation is ongoing, but not yet complete and could result in the identification of tribal cultural resources as described under PRC Section 21074. Tribal cultural resources may be identified during consultation. Because consultation is ongoing, this impact would be **potentially significant** for the overall WVFMP as well as the Identified Treatment Projects.

<u>Overall WVFMP</u>

UC Berkeley sent letters on October 24, 2019, notifying three Native American tribes that preparation of an EIR has begun pursuant to PRC Sections 21080.3.1 and 21080.3.2. One tribe, the Northern Valley Yokut Tribe, requested the initiation of tribal consultation and consultation is ongoing (Table 3.4-1). A response was not received from the other two tribes, and the statutory timeframe for consultation has ended. Tribal cultural resources may be identified within the Plan Area during consultation and, if identified and within areas proposed for ground-disturbing treatment or prescribed burning (including pile burning), could be affected by treatments implemented under the WVFMP. Until consultation has concluded and potential resources (if any) have been identified, it is unknown whether tribal cultural resources could be affected by implementation of the WVFMP. Because tribal consultation pursuant to PRC Section 21080.3.1 is not yet complete, this impact could be **potentially significant**.

Identified Treatment Projects

The Identified Treatment Projects would involve implementation of treatment activities that have the potential to disturb cultural resources. Tribal consultation pursuant to PRC Section 21080.3.1 for the WVFMP addresses both the overall WVFMP as well as the Identified Treatment Projects. As discussed above, consultation with the Northern Valley Yokut Tribe is ongoing. Because consultation is not yet complete, this impact could be **potentially significant**.

Mitigation Measures

Mitigation Measure CUL-2: Complete Tribal Consultation (PRC Sections 21080.3.1 and 21080.3.2) and Avoid Potential Effects on Tribal Cultural Resources

UC Berkeley will complete tribal consultation pursuant to PRC Sections 21080.3.1 and 21080.3.2. If no tribal cultural resource is identified during consultation, no further mitigation is required.

If UC Berkeley determines that a treatment may cause a substantial adverse change to a tribal cultural resource, and measures to protect the resource are not otherwise identified in the consultation process, provisions under PRC Section 21084.3(b) describe mitigation measures that may avoid or minimize the significant adverse impacts. Examples include:

1. Avoidance and preservation of the resources in place, including, but not limited to, designing the treatment to avoid the resources and protect the cultural and natural context.
2. Treating the resource with culturally appropriate dignity taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:
   A. Protecting the cultural character and integrity of the resource;
   B. Protecting the traditional use of the resource;
   C. Protecting the confidentiality of the resource.

Significance after Mitigation

Implementation of Mitigation Measure CUL-2 would reduce impacts from implementation of the overall WVFMP as well as the Identified Treatment Projects by requiring completion of tribal consultation and identification of measures to protect identified resources, if any. UC Berkeley anticipates that through completion of the tribal consultation process, all impacts to tribal cultural resources would be reduced to a less-than-significant level. However, given that tribal consultation is ongoing, it cannot be known at this time whether measures developed during consultation would adequately avoid a substantial adverse change in the significance of a tribal cultural resource or would be feasible for project proponents to implement. Therefore, recognizing that tribal consultation has yet to conclude, it is not known if implementation of the WVFMP could cause a substantial adverse change in the significance of a tribal cultural resource; this impact would remain **potentially significant and unavoidable** for the overall WVFMP as well as the Identified Treatment Projects.

Impact CUL-3: Disturb Human Remains

Ground disturbing activities related to vegetation treatments could unearth previously undiscovered or unrecorded human remains, if they are present. Compliance with California Health and Safety Code Sections 7050.5 and 7052 and California Public Resources Code Section 5097 would make this impact **less than significant** for the overall WVFMP as well as the Identified Treatment Projects.

Overall WVFMP

Although there are no recorded human remains within the Plan Area, there is a possibility that subsurface unmarked, or previously unknown Native American or other graves, including those interred outside formal cemeteries, could be present. Herbicide application and prescribed burning would not require soil disturbance because activities would be limited to the use of herbicides to kill or remove the above-ground portions of vegetation in the treatment area. Therefore, these treatment activities are not expected to disturb subsurface remains. However, manual and mechanical vegetation treatments and managed herbivory could result in ground disturbance during vegetation treatments, which could disturb subsurface remains. Because of the depth of any ground disturbance relative to the anticipated depth of buried human remains, treatment activities under the WVFMP have low potential to uncover previously unknown remains, which are typically buried deeper than any ground disturbance associated with proposed treatments. Nevertheless, if present near the ground surface, there is a possibility that unmarked, previously unknown Native American or other graves could be uncovered during ground disturbing activities.

California law protects Native American human burials, skeletal remains, cremated remains, and items associated with Native American burials from vandalism and inadvertent destruction. The procedures for the treatment of Native American human remains are contained in California Health and Safety Code Sections 7050.5 and 7052 and PRC Section 5097. These statutes require that, if human remains are discovered, potentially damaging ground-disturbing activities in the area of the remains will be halted immediately, and the county coroner and will be notified immediately. If the remains are determined by the coroner to be Native American, NAHC will be notified within 24 hours and the guidelines of the NAHC will be adhered to in the treatment and disposition of the remains. Following the coroner's findings, the NAHC-designated Most Likely Descendant (MLD), and UC Berkeley as the landowner will determine the ultimate treatment and disposition of the remains and take appropriate steps to ensure that additional human interments, if present, are not disturbed. If the NAHC is unable to identify the MLD, the MLD fails to make a recommendation, or UC Berkeley rejects the MLD's recommendation and mediation by NAHC fails to provide acceptable measures, UC Berkeley will rebury the Native American remains and associated grave goods with appropriate dignity on the property in an area not subject to further disturbance in accordance with State CEQA Guidelines Section 15064.5(e)(2). The responsibilities for acting upon notification of a discovery of Native American human remains are identified in PRC Section 5097.94.

Compliance with California Health and Safety Code Sections 7050.5 and 7052 and PRC Section 5097, requires avoiding or minimizing disturbance of human remains, and appropriately treating any remains that are discovered. In compliance with California law, this impact would be **less than significant**.

Identified Treatment Projects

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and herbicide application. As described for the overall WVFMP, use of herbicides is not expected to result in ground disturbance, but manual and mechanical treatments could result in ground disturbance during vegetation treatments. During implementation of the Identified Treatment Projects, the same regulatory requirements and procedures for the treatment of Native American human remains as stated in California Health and Safety Code Sections 7050.5 and 7052 and PRC Section 5097 would also apply. Therefore, the potential for inadvertent damage to or disturbance of human remains would be the same as described above for the overall WVFMP and this impact would be **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

3.5 BIOLOGICAL RESOURCES

This section evaluates the potential for implementation of the WVFMP to affect common and sensitive biological resources. It describes the regulatory setting and environmental conditions of the Plan Area and evaluates the impacts that could occur to biological resources. Comments were received from the Claremont Canyon Conservancy, East Bay Pesticide Alert, and several members of the public in response to the Notice of Preparation (NOP) regarding special-status wildlife, pallid manzanita (*Arctostaphylos pallida*), Alameda whipsnake (*Masticophis lateralis euryxanthus*), wildlife habitat, coast live oak (*Quercus agrifolia*) trees, sudden oak death, vegetation mapping within the Plan Area, vegetation type conversion, and the use of herbicides and pesticides. These issues are considered below. Refer to Appendix D for a summary of comments received on the NOP.

Data reviewed in preparation of this analysis include:

- results of California Natural Diversity Database (CNDDB) record search of the Richmond, Briones Valley, Walnut Creek, Oakland West, Oakland East, Las Trampas Ridge, Hayward, San Leandro, and Hunters Point U.S. Geological Survey (USGS) 7.5-minute quadrangles (CNDDB 2020);
- results of California Native Plant Society (CNPS), Rare Plant Program database search of the Richmond, Briones Valley, Walnut Creek, Oakland West, Oakland East, Las Trampas Ridge, Hayward, San Leandro, and Hunters Point USGS 7.5-minute quadrangles (CNPS 2020);
- results of U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) electronic records search (USFWS 2020a);
- California Wildlife Habitat Relationships (CDFW 2020);
- USFWS National Wetland Inventory (USFWS 2020b);
- *Rare Plant Survey Report* (CCCI 2016);
- *UC Berkeley 2020 Long Range Development Plan* (LRDP, UC Berkeley 2005);
- *City of Berkeley General Plan* (City of Berkeley 2001);
- *City of Oakland General Plan* (City of Oakland 1998);
- *Alameda County General Plan* (Alameda County 1994a, Alameda County 1994b);
- *Contra Costa County General Plan* (Contra Costa County 2005); and
- aerial photographs of the Plan Area and region.

Additional data reviewed for this section include results of field surveys and habitat analysis conducted by Condor Country Consulting, Inc. (CCCI) and Swaim Biological Inc. (SBI) in support of WVFMP development and EIR preparation. CCCI conducted protocol-level surveys for special-status plants in March, May, and August of 2019; California red-legged frog (*Rana draytonii*) habitat assessments in February, March, and April of 2019; San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*) surveys in May and August of 2019; and sensitive natural community surveys in May of 2020. Reports are listed below:

- *Special Status Plant Species Survey Report* (CCCI 2019a; provided in Appendix E1);
- *California Red-Legged Frog Habitat Assessment* (CCCI 2019b; provided in Appendix E2);
- *San Francisco Dusky-Footed Woodrat Nest Survey Report* (CCCI 2019c; provided in Appendix E3); and
- *Sensitive Plant Communities Survey Report* (CCCI 2020; provided in Appendix E4).

SBI conducted reconnaissance surveys for the Identified Treatment Projects in September, October, November, and December of 2019. SBI mapped vegetation communities in the Plan Area, mapped San Francisco dusky-footed woodrat nests, assessed habitat suitability for Alameda whipsnake, and provided locations of known occurrences of

Alameda whipsnake throughout the Plan Area. SBI also provided technical information regarding the likelihood and relative frequency of Alameda whipsnake occurrence in the Identified Treatment Project areas.

3.5.1 Environmental Setting

VEGETATION COMMUNITIES

The vegetation community types in the Plan Area are based on a combination of the characterizations in *A Manual of California Vegetation* (Sawyer et al. 2009) and the land cover types identified by *California Vegetation* (Holland 1986) and the USFWS National Wetland Inventory (USFWS 2020b), as presented in habitat assessments prepared for the Federal Emergency Management Agency (FEMA) for a previously proposed, but never approved, wildfire risk reduction plan in the Hill Campus (FEMA 2014). The distribution of these vegetation communities in the Plan Area was verified and refined by SBI and mapped in Figure 3.5-1. Vegetation communities within 0.25 mile of the Plan Area boundary were also mapped in areas with contiguous natural vegetation.

The total acreage of each vegetation community and the corresponding habitat types described in the CDFW California Wildlife Habitat Relationship (CWHR) classification scheme are presented in Table 3.5-1 (CDFW 2020). The acreage of each vegetation community within each Identified Treatment Project area is presented in Table 3.5-4. The descriptions of vegetation community types are derived from the WVFMP Special Status Plant Species Survey Report (CCCI 2019a, Appendix E1) and are provided below the table. All vegetation communities described below for the Plan Area are also present within the Identified Treatment Projects.

Table 3.5-1 Total Acres of Vegetation Communities in the Plan Area and Corresponding CWHR Habitat Types

Vegetation Community Type	CWHR Habitat Types	Size (acres)
Oak-Bay Woodland	Coastal Oak Woodland	185.2
Scrub	Coastal Scrub	166.8
Eucalyptus Forest	Eucalyptus	148.6
Coniferous Forest/Nonnative Coniferous Forest	Closed-Cone Pine-Cypress	132.4
Developed/Disturbed/Landscaped	Urban Barren	110.6
Successional Grassland	Annual Grassland Coastal Scrub	56.4
Riverine	Riverine	9.5 miles (total length)

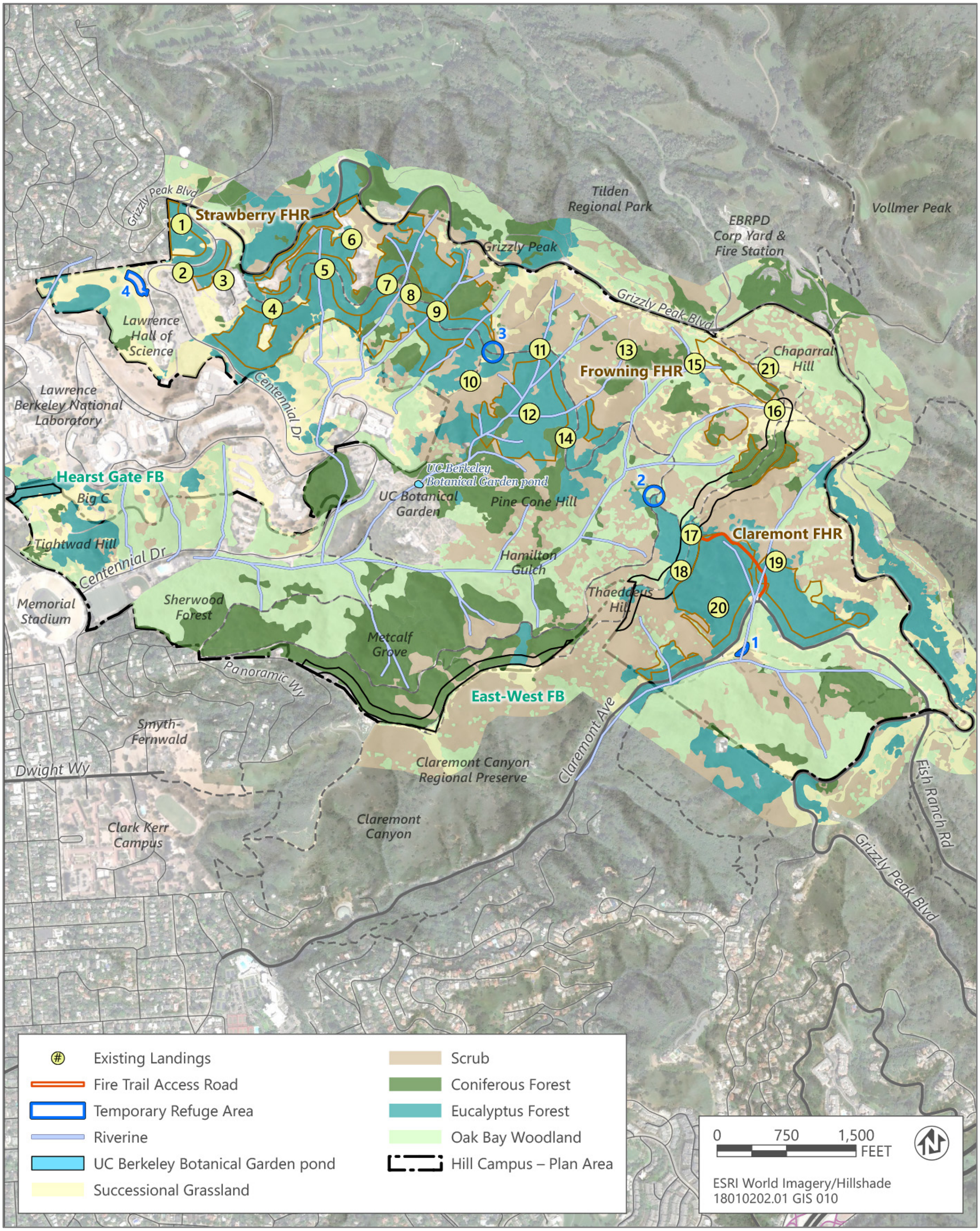
Source: Data compiled by Ascent Environmental and Swaim Biological, Inc. in 2020; CDFW 2020; CCCI 2019a; USFWS 2020b

Oak-Bay Woodland

Oak-bay woodland in the Plan area and Identified Treatment Project areas consists of coast live oak and California bay trees. Other native trees within this habitat include California buckeye (*Aesculus californica*), bigleaf maple (*Acer macrophyllum*), and madrone (*Arbutus menziesii*). Understory trees and shrubs include poison oak, coyote brush, California hazelnut (*Corylus cornuta*), and toyon.

Scrub

Two types of scrub habitat have been identified within the Plan Area and Identified Treatment Project areas: coastal scrub and coyote brush scrub.



Source: data downloaded from University of California, Berkeley in 2019, USGS in 2019, and data provided by Swaim Biological, Inc. in 2020

Figure 3.5-1 Vegetation Communities in the Plan Area and Identified Treatment Projects

Coastal Scrub

Coastal scrub habitat within the Plan Area and Identified Treatment Project areas is generally characterized by open to dense woody shrub cover with sparse tree cover. Shrub species within this habitat include coyote brush (*Baccharis pilularis*), California sagebrush (*Artemisia californica*), toyon (*Heteromeles arbutifolia*), silver bush lupine (*Lupinus albifrons*), poison oak (*Toxicodendron diversilobum*), and sticky monkeyflower (*Diplacus aurantiacus*). Tree species, including coast live oak (*Quercus agrifolia*), California bay (*Umbellularia californica*), and Monterey pine (*Pinus radiata*), occur sporadically within this habitat. Various native and nonnative grasses and forbs also occur.

Coyote Brush Scrub

Coyote brush scrub habitat within the Plan Area and Identified Treatment Project areas is distinct from coastal scrub by the density of coyote brush compared to other shrub species. In areas where coyote brush is dense, understory cover is typically sparse and can include native and nonnative forbs and grasses.

Eucalyptus Forest

Eucalyptus stands in the Plan Area and Identified Treatment Project areas, which are dominated by blue gum (*Eucalyptus globulus*), range between young stands (i.e., less than 40 years old) to mature stands (i.e., over 40 years old). Eucalyptus is not native to the East Bay Hills; however, the understory includes native species such as California blackberry, poison oak, toyon, and coyote brush. Additionally, redwood trees (*Sequoia sempervirens*) are occasionally present in the stands of eucalyptus. Nonnative understory species include cotoneaster (*Cotoneaster* spp.) and French broom.

Coniferous Forest/Nonnative Coniferous Forest

Coniferous forest habitat within the Plan Area and Identified Treatment Project areas is dominated by Monterey pine, which is not native to the East Bay Hills. The understory in this community is typically sparse; however, some areas may include understory species like California blackberry (*Rubus ursinus*), coyote brush, and poison oak.

Developed/Disturbed/Landscaped

Developed, disturbed, and landscaped habitat within the Plan Area and Identified Treatment Project areas includes residential and urban development, landscaped and maintained parklands (e.g., UC Berkeley Botanical Garden), roads, and trails. Landscape vegetation includes ornamental trees, shrubs, and nonnative herbaceous species. These areas include development associated with UC Berkeley. Disturbed areas can be susceptible to invasion by nonnative plant species, like French broom (*Genista monspessulana*), fennel (*Foeniculum vulgare*), poison hemlock (*Conium maculatum*), and Italian thistle (*Carduus pycnocephalus*).

Riverine and Riparian Woodland

Two perennial creeks, Strawberry Creek and Claremont Creek, run through the Plan Area, as do several unnamed intermittent drainages. These creeks and drainages run a total length of approximately 9.5 miles within the Plan Area (designated as riverine in Figure 3.5-1, Table 3.5-1). Tributaries to Claremont Creek run through the TRA 1 and Claremont FHR project areas. Tributaries to Strawberry Creek run through the Strawberry FHR and Frowning FHR project areas and the south fork of Strawberry Creek runs through the Frowning FHR project area. Refer to Figure 3.9-1 and Table 3.9-1 in Section 3.9, “Hydrology and Water Quality” for additional information about the location of watercourses relative to Identified Treatment Project areas. Riparian woodland habitat is present along some portions of these creeks and other drainages within the Plan Area, although the extent of this vegetation community commonly associated with riverine areas was not mapped. The dominant species in riverine and riparian woodland is Arroyo willow (*Salix lasiolepis*) and the habitat also includes California bay, coast live oak, California blackberry, thimbleberry (*Rubus parviflorus*), and blue gum.

Successional Grassland

The Plan Area contains approximately 56.4 acres of successional grassland habitat (Figure 3.5-1, Table 3.5-1). Successional grassland habitat is characterized by grasslands that are in the process of transitioning into shrub-dominated communities. This habitat is dominated by nonnative annual grasses and forbs, but also contains shrub species, including coyote brush, sticky monkeyflower, and poison oak.

SENSITIVE BIOLOGICAL RESOURCES

Special-Status Species

Special-status species are defined as species that are legally protected or that are otherwise considered sensitive by federal, state, or local resource agencies. Special-status species are species, subspecies, or varieties that fall into one or more of the following categories, regardless of their legal or protection status:

- officially listed by California under the California Endangered Species Act (CESA) or the federal government under the Endangered Species Act (ESA) as endangered, threatened, or rare;
- a candidate for state or federal listing as endangered, threatened, or rare under CESA or ESA;
- taxa (i.e., taxonomic category or group) that meet the criteria for listing, even if not currently included on any list, as described in California Code of Regulations (CCR) Section 15380 of the State CEQA Guidelines;
- species identified by CDFW as Species of Special Concern;
- species listed as Fully Protected under the California Fish and Game Code;
- species afforded protection under local planning documents; and
- taxa considered by the CDFW to be "rare, threatened, or endangered in California" and assigned a California Rare Plant Rank (CRPR) of 1, 2, or 3. The CDFW system includes rarity and endangerment ranks for categorizing plant species of concern, and ranks 1, 2, and 3 are summarized as follows:
  - CRPR 1A - Plants presumed to be extinct in California;
  - CRPR 1B - Plants that are rare, threatened, or endangered in California and elsewhere;
  - CRPR 2A - Plants presumed to be extinct in California but common elsewhere;
  - CRPR 2B - Plants that are rare, threatened, or endangered in California but more common elsewhere; and
  - CRPR 3 - Plants about which more information is needed (a review list).

The term "California species of special concern" is applied by CDFW to animals not listed under ESA or CESA, but that are considered to be declining at a rate that could result in listing, or that historically occurred in low numbers and known threats to their persistence currently exist. CDFW's fully protected status was California's first attempt to identify and protect animals that were rare or facing extinction. Most species listed as fully protected were eventually listed as threatened or endangered under CESA; however, some species remain listed as fully protected but do not have simultaneous listing under CESA. Fully protected species may not be taken or possessed at any time and no take permits can be issued for these species except for scientific research purposes or for relocation to protect livestock.

Of the 54 special-status plant species that are known to occur within the nine U.S. Geological Survey (USGS) 7.5-minute quadrangles surrounding the Plan Area, 22 species were determined to have potential to occur in the Plan Area based on the presence of suitable habitat, and one is known to occur (CNDDB 2020, CNPS 2020, CCCI 2019a, Table 3.5-2). Of the 49 special-status wildlife species that could occur within the nine USGS quadrangles surrounding the Plan Area, 14 were determined to have potential to occur in the Plan Area based on the presence of suitable habitat and two are known to occur (CNDDB 2020, Table 3.5-3). Table 3.5-2 and 3.5-3 provide lists of the special-status plant and special-status wildlife species, respectively, that have been documented in the Plan Area or within the nine USGS quadrangles surrounding the Plan Area. The tables describe the species' regulatory status, habitat, and potential for occurrence in the Plan Area and the Identified Treatment Projects. The Identified Treatment Projects encompass the same habitats and vegetation communities that are characteristic of the entire Plan Area; therefore, the potential for occurrence pertains to the Plan Area for the overall WVFMP as well as the Identified Treatment Projects; additional detail for Identified Treatment Projects is provided for those species that are known to occur. The proposed location of TRA 4 is entirely within a paved parking lot where there is no potential for special-status species habitat to occur, although impacts consider habitat near the project area that could be indirectly affected by disturbance.

Table 3.5-2 Special-Status Plant Species Known to Occur in the Hill Campus Vicinity and Their Potential for Occurrence in the Plan Area and Identified Treatment Projects

Species	Listing Status[1] Federal	Listing Status[1] State	Listing Status[1] CRPR	Habitat	Potential for Occurrence[2]
Bent-flowered fiddleneck *Amsinckia lunaris*	–	–	1B.2	Cismontane woodland, valley and foothill grassland, coastal bluff scrub. 10–2,608 feet in elevation. Blooms March–June.	May occur. The Plan Area contains potentially suitable woodland, grassland, and scrub habitat for this species.
Pallid manzanita *Arctostaphylos pallida*	FT	SE	1B.1	Broadleafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, coastal scrub. Grows on uplifted marine terraces on siliceous shale or thin chert. May require fire. 591–1,509 feet in elevation. Blooms December–March.	May occur. The Plan Area contains potentially suitable woodland and scrub habitat for this species.
Alkali milk-vetch *Astragalus tener* var. *tener*	–	–	1B.2	Low ground, alkali flats, and flooded lands; in annual grassland or in playas or vernal pools. 0–551 feet in elevation. Blooms March–June.	Not expected to occur. The Plan Area does not contain alkaline soils.
Big-scale balsamroot *Balsamorhiza macrolepis*	–	–	1B.2	Chaparral, valley and foothill grassland, cismontane woodland. Sometimes on serpentine. 115–4,806 feet in elevation. Blooms March–June.	May occur. The Plan Area contains potentially suitable grassland and woodland habitat.
Big tarplant *Blepharizonia plumosa*	–	–	1B.1	Dry hills and plains in annual grassland. Clay to clay-loam soils; usually on slopes and often in burned areas. 98–1,657 feet in elevation. Blooms July–October.	May occur. The Plan Area contains potentially suitable grassland habitat.
Mt. Diablo fairy-lantern *Calochortus pulchellus*	–	–	1B.2	On wooded and brushy slopes. 98–3,002 feet in elevation. Blooms April–June.	May occur. The Plan Area contains potentially suitable woodland and shrub habitat.
Coastal bluff morning-glory *Calystegia purpurata* ssp. *saxicola*	–	–	1B.2	Coastal dunes, coastal scrub, coastal bluff scrub, north coast coniferous forest. 33–344 feet in elevation. Blooms April–September.	Not expected to occur. The Plan Area does not contain suitable coastal dune habitat.
Bristly sedge *Carex comosa*	–	–	2B.1	Lake margins, wet places, grassland. -16–5,315 feet in elevation. Blooms May–September.	May occur. The Plan Area contains potentially suitable grassland habitat.
Congdon's tarplant *Centromadia parryi* ssp. *congdonii*	–	–	1B.1	Grassland habitat, often associated with alkaline soils, sometimes described as heavy white clay. 0–755 feet in elevation. Blooms May–October.	May occur. The Plan Area contains potentially suitable grassland habitat.
Point Reyes salty bird's-beak *Chloropyron maritimum* ssp. *palustre*	–	–	1B.2	Usually in coastal salt marsh with *Salicornia*, *Distichlis*, *Jaumea*, *Spartina*, etc. 0–377 feet in elevation. Blooms June–October.	Not expected to occur. The Plan Area does not contain suitable salt marsh habitat.
San Francisco Bay spineflower *Chorizanthe cuspidata* var. *cuspidata*	–	–	1B.2	Sandy soil on terraces and slopes. 10–705 feet in elevation. Blooms April–July.	Not expected to occur. The Plan Area does not contain sandy terrace habitat.
Robust spineflower *Chorizanthe robusta* var. *robusta*	FE	–	1B.1	Sandy terraces and bluffs or in loose sand. 30–804 feet in elevation. Blooms April–September.	Not expected to occur. The Plan Area does not contain sandy terrace or sandy bluff habitat.

Species	Listing Status[1] Federal	Listing Status[1] State	Listing Status[1] CRPR	Habitat	Potential for Occurrence[2]
Bolander's water-hemlock *Cicuta maculata* var. *bolanderi*	–	–	2B.1	Marshes and swamps, fresh or brackish water. 0–656 feet in elevation. Blooms July–September.	Not expected to occur. The Plan Area does not contain suitable marsh or swamp habitat.
Franciscan thistle *Cirsium andrewsii*	–	–	1B.2	Coastal bluff scrub, broadleaved upland forest, coastal scrub, coastal prairie. Sometimes serpentine seeps. 0–492 feet in elevation. Blooms March–July.	May occur. The Plan Area contains potentially suitable coastal scrub habitat.
Presidio clarkia *Clarkia franciscana*	FE	SE	1B.1	Serpentine outcrops in grassland or scrub. 66–1,001 feet in elevation. Blooms May–July.	Not expected to occur. The Plan Area does not contain serpentine soils.
Western leatherwood *Dirca occidentalis*	–	–	1B.2	On brushy slopes, mesic sites; mostly in mixed evergreen and foothill woodland communities. 82–1,394 feet in elevation. Blooms January–March.	Known to occur. This species was observed during rare plant surveys within certain Identified Treatment Project areas in March of 2018 (CCCI 2019a). Refer to map in Appendix E1. Western leatherwood was observed within TRA 2 and near the Frowning FHR.
Tiburon buckwheat *Eriogonum luteolum* var. *caninum*	–	–	1B.2	Serpentine soils; sandy to gravelly sites. 0–2,297 feet in elevation. Blooms May–September.	Not expected to occur. The Plan Area does not contain serpentine soils.
Jepson's coyote-thistle *Eryngium jepsonii*	–	–	1B.2	Vernal pools, valley and foothill grassland. Clay. 10–984 feet in elevation. Blooms April–August.	Not expected to occur. The Plan Area does not contain vernal pool habitat.
San Joaquin spearscale *Extriplex joaquinana*	–	–	1B.2	In seasonal alkali wetlands or alkali sink scrub with *Distichlis spicata*, *Frankenia*, etc. 3–2,740 feet in elevation. Blooms April–October.	Not expected to occur. The Plan Area does not contain alkali wetland or alkali sink scrub habitat.
Minute pocket moss *Fissidens pauperculus*	–	–	1B.2	Moss growing on damp soil along the coast. In dry streambeds and on stream banks. 33–3,360 feet in elevation.	May occur. The Plan Area contains potentially suitable stream bank habitat.
Fragrant fritillary *Fritillaria liliacea*	–	–	1B.2	Often on serpentine; various soils reported though usually on clay, in grassland. 10–1,312 feet in elevation. Blooms February–April.	May occur. The Plan Area contains potentially suitable grassland habitat.
Blue coast gilia *Gilia capitata* ssp. *chamissonis*	–	–	1B.1	Coastal dunes, coastal scrub. 10–656 feet in elevation. Blooms April–July.	Not expected to occur. The Plan Area does not contain suitable coastal dune habitat.
Dark-eyed gilia *Gilia millefoliata*	–	–	1B.2	Coastal dunes. 3–197 feet in elevation. Blooms April–July.	Not expected to occur. The Plan Area does not contain suitable coastal dune habitat.
Diablo helianthella *Helianthella castanea*	–	–	1B.2	Usually in chaparral/oak woodland interface in rocky, azonal soils. Often in partial shade. 148–3,510 feet in elevation. Blooms March–June.	May occur. The Plan Area contains potentially suitable woodland habitat.
Congested-headed hayfield tarplant *Hemizonia congesta* ssp. *congesta*	–	–	1B.2	Grassy valleys and hills, often in fallow fields; sometimes along roadsides. 66–2,133 feet in elevation. Blooms April–November.	May occur. The Plan Area contains potentially suitable grassland habitat.

Species	Listing Status[1] Federal	Listing Status[1] State	Listing Status[1] CRPR	Habitat	Potential for Occurrence[2]
Water star-grass *Heteranthera dubia*	–	–	2B.2	Alkaline, still or slow-moving water. Requires a pH of 7 or higher, usually in slightly eutrophic waters. 49–4,954 feet in elevation. Blooms July–October.	Not expected to occur. The Plan Area does not contain suitable alkaline aquatic habitat.
Loma Prieta hoita *Hoita strobilina*	–	–	1B.1	Chaparral, cismontane woodland, riparian woodland. Serpentine; mesic sites. 197–3,199 feet in elevation. Blooms May–July.	Not expected to occur. The Plan Area does not contain serpentine soils.
Santa Cruz tarplant *Holocarpha macradenia*	FT	SE	1B.1	Coastal prairie, coastal scrub, valley and foothill grassland. Light, sandy soil or sandy clay; often with nonnatives. 33–722 feet in elevation. Occurrences at elevations greater than 400 feet are introduced. Blooms June–October.	Not expected to occur. The nearest known occurrences are either extirpated or are part of an introduced population within Wildcat Canyon Regional Park approximately 4 miles north of the Plan Area.
Kellogg's horkelia *Horkelia cuneata* var. *sericea*	–	–	1B.1	Old dunes, coastal sandhills; openings. 16–705 feet in elevation. Blooms April–September.	Not expected to occur. The Plan Area does not contain dune or sandhill habitat.
Carquinez goldenbush *Isocoma arguta*	–	–	1B.1	Alkaline soils, flats, lower hills. On low benches near drainages and on tops and sides of mounds in swale habitat. 3–164 feet in elevation. Blooms August–December.	Not expected to occur. The Plan Area does not contain alkaline soils.
Northern California black walnut *Juglans hindsii*	–	–	1B.1	Riparian forest, riparian woodland. Few extant native stands remain; widely naturalized. Deep alluvial soil, associated with a creek or stream. 0–2,100 feet in elevation. Blooms April–May.	May occur. The Plan Area contains potentially suitable riparian woodland habitat.
Contra Costa goldfields *Lasthenia conjugens*	FE	–	1B.1	Vernal pools, swales, low depressions, in open grassy areas. 3–1,476 feet in elevation. Blooms March–June.	Not expected to occur. The Plan Area does not contain vernal pool habitat.
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	–	–	1B.2	Freshwater and brackish marshes. Usually on marsh and slough edges. 0–16 feet in elevation. Blooms May–July.	Not expected to occur. The Plan Area does not contain marsh habitat and is outside of the elevation range of this species.
Beach layia *Layia carnosa*	FE	SE	1B.1	On sparsely vegetated, semi-stabilized dunes, usually behind foredunes. 0–98 feet in elevation. Blooms March–July.	Not expected to occur. The Plan Area does not contain dune habitat.
Rose leptosiphon *Leptosiphon rosaceus*	–	–	1B.1	Coastal bluff scrub. 33–459 feet in elevation. Blooms April–July.	Not expected to occur. The Plan Area does not contain coastal bluff habitat.
Hall's bush-mallow *Malacothamnus hallii*	–	–	1B.2	Chaparral, coastal scrub. Some populations on serpentine. 33–2,395 feet in elevation. Blooms May–September.	May occur. The Plan Area contains potentially suitable coastal scrub habitat.
Oregon meconella *Meconella oregana*	–	–	1B.1	Coastal prairie, coastal scrub. Open, moist places. 197–2,100 feet in elevation. Blooms March–April.	May occur. The Plan Area contains potentially suitable coastal scrub habitat.
Mt. Diablo cottonweed *Micropus amphibolus*	–	–	3.2	Bare, grassy or rocky slopes. 148–2,707 feet in elevation. Blooms March–May.	May occur. The Plan Area contains potentially suitable grassland habitat.

Species	Listing Status[1] Federal	Listing Status[1] State	Listing Status[1] CRPR	Habitat	Potential for Occurrence[2]
San Antonio Hills monardella *Monardella antonina* ssp. *antonina*	–	–	3	Cismontane woodland, chaparral. 1,050–3,281 feet in elevation. Blooms June–August.	May occur. The Plan Area contains potentially suitable woodland habitat.
Woodland woollythreads *Monolopia gracilens*	–	–	1B.2	Grassy sites, in openings; sandy to rocky soils. Often seen on serpentine after burns but may have only weak affinity to serpentine. 328–3,937 feet in elevation. Blooms March–July.	May occur. The Plan Area contains potentially suitable grassland habitat.
Lime Ridge navarretia *Navarretia gowenii*	–	–	1B.1	On clay, serpentine soils. 591–1,001 feet in elevation. Blooms May–June.	Not expected to occur. The Plan Area does not contain serpentine soils.
Antioch Dunes evening-primrose *Oenothera deltoides* ssp. *howellii*	FE	SE	1B.1	Interior dunes. Remnant river bluffs and sand dunes east of Antioch. 0–98 feet in elevation. Blooms March–September.	Not expected to occur. The Plan Area does not contain dune habitat.
Choris' popcornflower *Plagiobothrys chorisianus* var. *chorisianus*	–	–	1B.2	Chaparral, coastal scrub, coastal prairie. Mesic sites. 49–525 feet in elevation. Blooms March–June.	May occur. The Plan Area contains potentially suitable coastal scrub and grassland habitat.
San Francisco popcornflower *Plagiobothrys diffusus*	–	SE	1B.1	Valley and foothill grassland, coastal prairie. Historically from grassy slopes with marine influence. 148–1,181 feet in elevation. Blooms March–June.	May occur. The Plan Area contains potentially suitable grassland habitat.
Hairless popcornflower *Plagiobothrys glaber*	–	–	1A	Coastal salt marshes and alkaline meadows. 16–591 feet in elevation. Blooms March–May.	Not expected to occur. The Plan Area does not contain salt marsh habitat
Marin knotweed *Polygonum marinense*	–	–	3.1	Coastal salt marshes and brackish marshes. 0–33 feet in elevation. Blooms May–August.	Not expected to occur. The Plan Area does not contain salt marsh habitat.
Adobe sanicle *Sanicula maritima*	–	SR	1B.1	Meadows and seeps, valley and foothill grassland, chaparral, coastal prairie. Moist clay or ultramafic soils. 98–787 feet in elevation. Blooms February–May.	May occur. The Plan Area contains potentially suitable grassland habitat.
Long-styled sand-spurrey *Spergularia macrotheca* var. *longistyla*	–	–	1B.2	Marshes, swamps, meadows, and seeps. Alkaline. 0–836 feet in elevation. Blooms February–May.	Not expected to occur. The Plan Area does not contain marsh or swamp habitat or alkaline soils.
Most beautiful jewelflower *Streptanthus albidus* ssp. *peramoenus*	–	–	1B.2	Serpentine outcrops, on ridges and slopes. 312–3,281 feet in elevation. Blooms April–September.	Not expected to occur. The Plan Area does not contain serpentine soils.
Slender-leaved pondweed *Stuckenia filiformis* ssp. *alpina*	–	–	2B.2	Shallow, clear water of lakes and drainage channels. 984–7,054 feet in elevation. Blooms May–July.	Not expected to occur. The Plan Area does not contain suitable lake or drainage channel habitat.
California seablite *Suaeda californica*	FE	–	1B.1	Margins of coastal salt marshes. 0–16 feet in elevation. Blooms July–October.	Not expected to occur. The Plan Area does not contain salt marsh habitat.
Saline clover *Trifolium hydrophilum*	–	–	1B.2	Salt marsh, swamp, vernal pool, and wetlands. Mesic, alkaline sites. 0–984 feet in elevation. Blooms April–June.	Not expected to occur. The Plan Area does not contain salt marsh, swamp, or vernal pool habitat.
San Francisco owl's-clover *Triphysaria floribunda*	–	–	1B.2	Coastal prairie and coastal scrub. On serpentine and non-serpentine substrate (such as at Pt. Reyes). 3–492 feet in elevation. Blooms April–June.	Not expected to occur. This species is associated with coastal areas in the San Francisco Bay Area.

Species	Listing Status[1] Federal	Listing Status[1] State	Listing Status[1] CRPR	Habitat	Potential for Occurrence[2]
Oval-leaved viburnum *Viburnum ellipticum*	–	–	2B.3	Chaparral, cismontane woodland, lower montane coniferous forest. 705–4,593 feet in elevation. Blooms May–June.	May occur. The Plan Area contains potentially suitable woodland habitat.

Notes: CRPR = California Rare Plant Rank; CESA = California Endangered Species Act; CEQA = California Environmental Quality Act; ESA = Endangered Species Act; NPPA = Native Plant Protection Act

1 Legal Status Definitions

Federal:

FE Federally Listed as Endangered (legally protected by ESA)
FT Federally Listed as Threatened (legally protected by ESA)

State:

SE State Listed as Endangered (legally protected by CESA)
SR State Listed as Rare (legally protected by NPPA)

California Rare Plant Ranks:

1A Plant species that are presumed extirpated or extinct because they have not been seen or collected in the wild in California for many years. A plant is extinct if it no longer occurs anywhere. A plant that is extirpated from California has been eliminated from California but may still occur elsewhere in its range.
1B Plant species considered rare or endangered in California and elsewhere (protected under CEQA, but not legally protected under ESA or CESA).
2B Plant species considered rare or endangered in California but more common elsewhere (protected under CEQA, but not legally protected under ESA or CESA).
3 Plant species for which there is not enough information to assign the species to one of the other ranks or reject them.

Threat Ranks:

0.1 Seriously threatened in California (over 80 percent of occurrences threatened; high degree and immediacy of threat)
0.2 Moderately threatened in California (20-80 percent occurrences threatened; moderate degree and immediacy of threat)
0.3 Not very threatened in California (less than 20 percent of occurrences threatened / low degree and immediacy of threat or no current threats known)

2 Potential for Occurrence Definitions

Not expected to occur: Species is unlikely to be present because of poor habitat quality, lack of suitable habitat features, or restricted current distribution of the species.
May occur: Suitable habitat is available and there have been nearby recorded occurrences of the species.
Known to occur: The species has been observed within the Plan Area.

Sources: CNDDB 2020; CNPS 2020; CCCI 2016; CCCI 2019a; USFWS 2020a

Table 3.5-3 Special-Status Wildlife Species Known to Occur in the Project Vicinity and Their Potential for Occurrence in the Plan Area

Species	Listing Status[1] Federal	Listing Status[1] State	Habitat	Potential for Occurrence[2]
Amphibians and Reptiles				
Alameda whipsnake *Masticophis lateralis euryxanthus*	FT	ST	Typically found in chaparral and scrub habitats but will also use adjacent grassland, oak savanna and woodland habitats. Areas with rock outcrops, deep crevices or abundant rodent burrows, where shrubs form a vegetative mosaic with oak trees and grasses.	Known to occur. The Plan Area is within the range of Alameda whipsnake, and individuals have been documented in several locations within and adjacent to the Plan Area (CNDDB 2020). The Plan Area contains a mosaic of scrub patches embedded within grassland and woodland communities, including nonnative eucalyptus and conifer forests, which could potentially be used by Alameda whipsnake. Alameda whipsnake has been observed within E-W Fuel Break and adjacent to the Claremont and Frowning FHR project areas (CNDDB 2020).

Species	Listing Status[1] Federal	Listing Status[1] State	Habitat	Potential for Occurrence[2]
California red-legged frog *Rana draytonii*	FT	SSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development. In the dry months, use a variety of microsites that remain moist and cool through the summer including leaf litter, dense understory, or small mammal burrows for refuge and foraging.	May occur. The nearest known occurrence of California red-legged frog is approximately 0.7 mile north of the Plan Area within a botanic garden pond in Tilden Regional Park (CCCI 2019b). This occurrence is presumed to be extirpated due to an infestation of nonnative bullfrogs (*Lithobates catesbeianus*; CCCI 2019b). There are other known occurrences of this species within the Wildcat Creek watershed, approximately 1.9 miles north of the Plan Area (CCCI 2019b). A habitat assessment was conducted within the Plan Area, and it was determined that while California red-legged frog dispersal into the Plan Area is unlikely, frogs may potentially occur, and that a pond within the UC Berkeley Botanical Garden may provide potentially suitable breeding habitat for the species (CCCI 2019b, Appendix E2).
California tiger salamander *Ambystoma californiense*	FT	ST	Need underground refuges, especially ground squirrel burrows, and vernal pools or other seasonal water sources for breeding.	Not expected to occur. The nearest known occurrences are approximately 7.2 miles south and 8.3 miles east of the Plan Area and are both considered extirpated due to urban and residential development (CNDDB 2020). There are no known occurrences within or adjacent to the Plan Area (CNDDB 2020). The Plan Area does not contain suitable vernal pool or grassland habitat with associated aquatic habitat for this species.
Foothill yellow-legged frog *Rana boylii*	–	SE	West/central coast clade. Partly-shaded, gently flowing, low-gradient, shallow streams and riffles with a rocky substrate in a variety of habitats. Need at least some cobble-sized substrate for egg-laying. Need at least 15 weeks to attain metamorphosis.	Not expected to occur. The nearest known occurrence of foothill yellow-legged frog is approximately 2.6 miles southeast of the Plan Area (CNDDB 2020). Other nearby occurrences (i.e., within 4 miles of the Plan Area) are considered to be extirpated, including one 1912 record within Claremont Creek in the Plan Area (CNDDB 2020). The natural flow of Claremont Creek has been altered through installation of culverts (EBRPD 2018). Stream habitat within the Plan Area includes Strawberry Creek and Claremont Creek. The portions of these creeks that are within the Plan Area are characterized by steep banks; high-gradient, fast-moving flows; and a general lack of pools (CCCI 2019b). These features do not provide adequate aquatic habitat for foothill yellow-legged frog.
Green sea turtle *Chelonia mydas*	FT	–	Marine. Completely herbivorous; needs adequate supply of seagrasses and algae.	Not expected to occur. The Plan Area does not contain suitable marine habitat for this species.
Northern California legless lizard *Anniella pulchra*	–	SSC	Sandy or loose loamy soils under sparse vegetation. Soil moisture is essential. They prefer soils with a high moisture content.	Not expected to occur. This Plan Area is outside of the current range of this species, which is known to occur in eastern Contra Costa County (CNDDB 2020).

Species	Listing Status[1] Federal	Listing Status[1] State	Habitat	Potential for Occurrence[2]
Western pond turtle *Actinemys marmorata*	–	SSC	Aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation, below 6,000 feet elevation. Need basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.3 mile from water for egg-laying.	May occur. There is one known occurrence approximately 1.4 mile south and one approximately 0.8 mile north of the Plan Area (CNDDB 2020). The aquatic resources within the Plan Area (e.g., Strawberry Creek, Claremont Creek, ponds associated with the UC Berkeley Botanical Garden) provide potentially suitable habitat for this species.
Birds				
Alameda song sparrow *Melospiza melodia pusillula*	–	SSC	Resident of salt marshes bordering south arm of San Francisco Bay. Inhabits *Salicornia* marshes; nests low in *Grindelia* bushes and in *Salicornia*.	Not expected to occur. The Plan Area does not contain suitable salt marsh habitat.
American peregrine falcon *Falco peregrinus anatum*	FD	SD FP	Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures. Nest consists of a scrape or a depression or ledge in an open site.	May occur. The Plan Area does not contain suitable ledge, cliff, or human-made nesting habitat for this species. However, the species is known to nest in the City of Berkeley and could potentially forage within the Plan Area.
Bald eagle *Haliaeetus leucocephalus*	FD	SE FP	Lower montane coniferous forest, old growth. Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.	Not expected to occur. The nearest known bald eagle nesting occurrence is adjacent to San Pablo Reservoir approximately 3.4 miles north of the Plan Area (CNDDB 2020). The Plan Area does not contain suitable nesting habitat or nearby aquatic habitat for this species.
Black skimmer *Rynchops niger*	–	SSC	Alkali playa, sand shore. Nests on gravel bars, low islets, and sandy beaches, in unvegetated sites. Nesting colonies usually less than 200 pairs.	Not expected to occur. The Plan Area does not contain suitable beach or gravel bar habitat for this species.
Burrowing owl *Athene cunicularia*	–	SSC	Open, dry annual or perennial grasslands, deserts and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel (*Otospermophilus beecheyi*).	May occur. There is one known occurrence approximately 4.9 miles northwest of the Plan Area in the City of Richmond (CNDDB 2020). Additionally, there have been several additional observations of the species; however, these observations are concentrated west of the Plan Area near Cesar Chavez Park (approximately 3.5 miles west of the Plan Area), and other areas along San Francisco Bay (eBird 2020). The Plan Area contains some grassland habitat which may be suitable for this species.
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, ponds.	Not expected to occur. Suitable pasture, prairie, and other agricultural habitat is not present within the Plan Area.
California (Ridgway's) clapper rail *Rallus obsoletus*	FE	SE FP	Salt-water 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.	Not expected to occur. The Plan Area does not include suitable marsh habitat for this species.

Species	Listing Status[1] Federal	Listing Status[1] State	Habitat	Potential for Occurrence[2]
California black rail *Laterallus jamaicensis coturniculus*	–	ST FP	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year and dense vegetation for nesting habitat.	Not expected to occur. The Plan Area does not include suitable marsh habitat for this species.
California least tern *Sternula antillarum browni*	FE	SE FP	Alkali playa, wetland. 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.	Not expected to occur. The Plan Area does not include suitable sand beach, alkali flat, or other suitable nesting habitat for this species.
Golden eagle *Aquila chrysaetos*	–	FP	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.	May occur. The Plan Area contains potentially suitable nesting habitat for this species within groves of large trees.
Northern harrier *Circus hudsonius*	–	SSC	Coastal salt and fresh-water marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain cienagas. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	May occur. The Plan Area contains potentially suitable grassland and scrub habitat for this species.
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	–	SSC	Resident of the San Francisco Bay region, in fresh and saltwater marshes. Requires thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.	Not expected to occur. The Plan Area does not contain suitable marsh habitat for this species.
San Pablo song sparrow *Melospiza melodia samuelis*	–	SSC	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.	Not expected to occur. The Plan Area does not contain suitable marsh habitat for this species.
Suisun song sparrow *Melospiza melodia maxillaris*	–	SSC	Marsh and swamp, wetlands. Resident of brackish-water marshes surrounding Suisun Bay. Inhabits cattails, tules and other sedges, and Salicornia; also known to frequent tangles bordering sloughs.	Not expected to occur. The Plan Area does not contain suitable marsh habitat for this species.
Western snowy plover *Charadrius alexandrinus nivosus*	FT	SSC	Great Basin standing waters, sand shore, wetland. Sandy beaches, salt pond levees and shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.	Not expected to occur. The Plan Area does not contain suitable nesting habitat (e.g., lake shore, beach, levees) for this species.

Species	Listing Status[1] Federal	Listing Status[1] State	Habitat	Potential for Occurrence[2]
Western yellow-billed cuckoo *Coccyzus americanus*	FT	SE	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape.	Not expected to occur. The Plan Area is outside of the current known range of this species.
White-tailed kite *Elanus leucurus*	–	FP	Cismontane woodland, marsh and swamp, riparian woodland, valley and foothill grassland, and wetlands. Rolling foothills and valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	May occur. The Plan Area contains potentially suitable nesting habitat for white-tailed kite within large trees.
Yellow rail *Coturnicops noveboracensis*	–	SSC	Freshwater marsh, meadow, and seep. Summer resident in eastern Sierra Nevada in Mono County.	Not expected to occur. The Plan Area does not contain suitable marsh habitat for this species.
Yellow warbler *Setophaga petechia*	–	SSC	Riparian plant associations in close proximity to water. Also nests in montane shrubbery in open conifer forests in Cascades and Sierra Nevada. Frequently found nesting and foraging in willow shrubs and thickets, and in other riparian plants including cottonwoods, sycamores, ash, and alders.	May occur. The Plan Area contains potentially suitable riparian woodland habitat for this species, and the species has been observed recently within and adjacent to the Plan Area (eBird 2020).
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	–	SSC	Marsh and swamp, wetland. Nests in freshwater emergent wetlands with dense vegetation and deep water. Often along borders of lakes or ponds. Nests only where large insects such as Odonata are abundant, nesting timed with maximum emergence of aquatic insects.	Not expected to occur. The Plan Area does not contain suitable marsh habitat for this species.
Fish				
Delta smelt *Hypomesus transpacificus*	FT	SE	Sacramento-San Joaquin Delta. Seasonally in Suisun Bay, Carquinez Strait and San Pablo Bay.	Not expected to occur. The Plan Area does not contain suitable aquatic habitat for this species.
Longfin smelt *Spirinchus thaleichthys*	FC	SSC	Found in open waters of estuaries, mostly in middle or bottom of water column. Prefer salinities of 15-30 ppt but can be found in completely freshwater to almost pure seawater.	Not expected to occur. The Plan Area does not contain suitable aquatic habitat for this species.

Species	Listing Status[1] Federal	Listing Status[1] State	Habitat	Potential for Occurrence[2]
Sacramento perch *Archoplites interruptus*	–	SSC	Historically found in the sloughs, slow-moving rivers, and lakes of the Central Valley. Prefers warm water. Aquatic vegetation is essential for young.	Not expected to occur. The Plan Area is outside of the current range of this species. There are known occurrences of Sacramento perch within Lake Anza and Jewel Lake approximately 1 mile north of the Plan Area in a watershed that is not connected to the Plan Area; however, it is unclear whether these fish were introduced into these reservoirs or if they were naturally occurring (CNDDB 2020).
Tidewater goby *Eucyclogobius newberryi*	FE	SSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	Not expected to occur. The Plan Area does not contain suitable brackish water (e.g., lagoons) habitat for this species.
Invertebrates				
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT	–	Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay. *Plantago erecta* is the primary host plant; *Orthocarpus densiflorus* and *Orthoacarpus purpurscens* are the secondary host plants.	Not expected to occur. The Plan Area does not contain serpentine soils. Additionally, there are currently six known core areas where the species occurs, and none are in Alameda County (Black and Vaughn 2005).
Callippe silverspot butterfly *Speyeria callippe callippe*	FE	–	Restricted to the northern coastal scrub of the San Francisco peninsula. Hostplant is *Viola pedunculata*. Most adults found on east-facing slopes; males congregate on hilltops in search of females.	Not expected to occur. Callippe silverspot butterfly is not present within much of the historic extent of its range and is currently only known to occur in a few locations, including in the hills near the City of Pleasanton in Alameda County (USFWS 2009).
Crotch bumble bee *Bombus crotchii*	–	SC	Coastal California east to the Sierra-Cascade crest and south into Mexico. Food plant genera include *Antirrhinum*, *Phacelia*, *Clarkia*, *Dendromecon*, *Eschscholzia*, and *Eriogonum*.	Not expected to occur. The nearest known historic occurrences of this species include one (1951) approximately 17 miles east of the Plan Area near Mount Diablo and one (1968) approximately 16 miles southeast of the Plan Area near the City of Hayward (CNDDB 2020). While the Plan Area is within the historic range of this species, crotch bumble bee has recently undergone a decline in abundance and distribution and is no longer present across much of its historic range, including the San Francisco Bay Area (Xerces 2018).
Monarch - California overwintering population *Danaus plexippus* pop. 1	–	–	Winter roost sites extend along the coast from northern Mendocino to Baja California, Mexico. Roosts located in wind-protected tree groves (eucalyptus, Monterey pine, cypress), with nectar and water sources nearby.	May occur. The Plan Area contains potentially suitable winter roost habitat within woodlands, including eucalyptus groves.

Species	Listing Status[1] Federal	Listing Status[1] State	Habitat	Potential for Occurrence[2]
San Bruno elfin butterfly *Callophrys mossii bayensis*	FE	–	Coastal, mountainous areas with grassy ground cover, mainly in the vicinity of San Bruno Mountain, San Mateo County. Colonies are located on steep, north-facing slopes within the fog belt. Larval host plant is *Sedum spathulifolium*.	Not expected to occur. The Plan Area is outside of the current known range of this species, which is restricted to San Mateo County (USFWS 2010).
Vernal pool fairy shrimp *Branchinecta lynchi*	FT	–	Endemic to the grasslands of the Central Valley, Central Coast mountains, and South Coast mountains, in astatic rain-filled pools. Inhabit small, clear-water sandstone-depression pools and grassed swale, earth slump, or basalt-flow depression pools.	Not expected to occur. The Plan Area does not contain suitable vernal pool habitat for this species.
Western bumble bee *Bombus occidentalis*	–	SC	Bumble bees have three basic habitat requirements: suitable nesting sites for the colonies, availability of nectar and pollen from floral resources throughout the duration of the colony period (spring, summer, and fall), and suitable overwintering sites for the queens.	Not expected to occur. The Plan Area is within the historic range of this species. However, western bumble bee has recently undergone a decline in abundance and distribution and is no longer present across much of its historic range. In California, western bumble bee populations are currently largely restricted to high elevation sites in the Sierra Nevada and a few locations on the northern California coast (Xerces 2018).
Mammals				
Alameda Island mole *Scapanus latimanus parvus*	–	SSC	Only known from Alameda Island. Found in a variety of habitats, especially annual and perennial grasslands. Prefers moist, friable soils. avoids flooded soils.	Not expected to occur. This Plan Area is outside of the known range of this species.
American badger *Taxidea taxus*	–	SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Needs sufficient food, friable soils and open, uncultivated ground. Preys on burrowing rodents. Digs burrows.	May occur. There is one historic (1925) occurrence of American badger approximately 1.5 miles east of the Plan Area (CNDDB 2020). The Plan Area contains potentially suitable grassland and shrub habitat for this species. While habitat adjacent to developed areas associated with the UC Berkeley would provide only marginal habitat for this species, there is suitable contiguous habitat east of the Plan Area.
Berkeley kangaroo rat *Dipodomys heermanni berkeleyensis*	–	–	Considered extinct. Open grassy hilltops and open spaces in chaparral and blue oak/digger pine woodlands. Needs fine, deep, well-drained soil for burrowing.	Not expected to occur. This species is considered extinct and no longer occurs within the Plan Area.
Big free-tailed bat *Nyctinomops macrotis*	–	SSC	Low-lying arid areas in Southern California. Need high cliffs or rocky outcrops for roosting sites. Feeds principally on large moths.	Not expected to occur. The Plan Area is outside of the typical range of this species. There is one known historic (1912) occurrence of this species on the UC Berkeley campus and one near the City of Martinez (1979) approximately 10.3 miles northeast of the Plan Area (CNDDB 2020). These observations are considered vagrants or extralimital records, and the species is not expected to occur regularly in the region.

Species	Listing Status[1] Federal	Listing Status[1] State	Habitat	Potential for Occurrence[2]
Mountain lion *Puma concolor*	–	SC	Mountain lions inhabit a wide range of ecosystems, including mountainous regions, forests, deserts, and wetlands. Mountain lions establish and defend large territories and can travel large distances in search of prey or mates. The Central Coast and Southern California Evolutionarily Significant Units (ESUs) were granted emergency listing status in April of 2020, and CDFW is currently reviewing a petition to list these ESUs as threatened under CESA.	May occur. Mountain lions are known to occur within the East Bay Hills. The Plan Area contains some relatively undeveloped habitat; however, is also contains areas of human development as well as heavily-used roads and trails. While habitat within the Plan Area is likely only marginally suitable for mountain lion denning, the species likely transits through the Plan Area with regularity.
Pallid bat *Antrozous pallidus*	–	SSC	Deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Sensitive to disturbance of roosting sites.	May occur. The Plan Area contains potentially suitable roost habitat for this species within large trees with exfoliating bark, crevices, or cavities. In addition, potentially suitable habitat for this species is present within and adjacent to the Plan Area within buildings and other human-made structures.
Salt-marsh harvest mouse *Reithrodontomys raviventris*	FE	SE FP	Only in the saline emergent wetlands of San Francisco Bay and its tributaries. Pickleweed is primary habitat but may occur in other marsh vegetation types and in adjacent upland areas. Does not burrow, build loosely organized nests. Requires higher areas for flood escape.	Not expected to occur. The Plan Area does not contain suitable salt marsh habitat for this species.
Salt-marsh wandering shrew *Sorex vagrans halicoetes*	–	SSC	Salt marshes of the south arm of San Francisco Bay. Medium high marsh 6-8 feet above sea level where abundant driftwood is scattered among Salicornia.	Not expected to occur. The Plan Area does not contain suitable salt marsh habitat for this species.
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	–	SSC	Forest habitats of moderate canopy and moderate to dense understory. May prefer chaparral and redwood habitats. Constructs nests of shredded grass, leaves, and other material. May be limited by availability of nest-building materials.	Known to occur. San Francisco dusky-footed woodrat nest surveys were conducted in May and November of 2019, and nearly 100 nests were located and mapped within the Plan Area during these surveys (CCCI 2019c, Appendix E3; surveys by SBI in 2019). This species is likely to nest throughout the woodland and scrub habitat in the Plan Area. San Francisco dusky-footed woodrat nests have been observed within the Strawberry, Frowning Ridge, and Claremont FHR project areas, as well as nearby landings and temporary refuge areas (CCCI 2019c).
San Pablo vole *Microtus californicus sanpabloensis*	–	SSC	Saltmarshes of San Pablo Creek, on the south shore of San Pablo Bay. Constructs burrow in soft soil. Feeds on grasses, sedges and herbs. Forms a network of runways leading from the burrow	Not expected to occur. The Plan Area does not contain suitable salt marsh habitat for this species and is outside of the species' known range.

Species	Listing Status[1] Federal	Listing Status[1] State	Habitat	Potential for Occurrence[2]
Townsend's big-eared bat *Corynorhinus townsendii*	–	SSC	Throughout California in a wide variety of habitats. Most common in mesic sites. Roosts in the open, hanging from walls and ceilings. Roosting sites limiting. Sensitive to human disturbance.	May occur. There is one known historic (1938) occurrence of a Townsend's big-eared bat colony within the Plan Area, associated with Strawberry Creek (CNDDB 2020). This colony is possibly extirpated (CNDDB 2020). Potentially suitable habitat for this species is present within and adjacent to the Plan Area within buildings and other human-made structures.
Western mastiff bat *Eumops perotis californicus*	–	SSC	Many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, and chaparral. Primarily a cliff-dweller, this species roosts in crevices in cliff faces, high buildings, trees, and tunnels.	Not expected to occur. There is one historic (1899) occurrence of this species near the City of Hayward approximately 15.6 miles southeast of the Plan Area. This species typically roosts in cliffs and rock crevices, which are not present within the Plan Area.
Western red bat *Lasiurus blossevillii*	–	SSC	Typically, solitary, roosting primarily in the foliage of trees or shrubs. Day roosts are commonly in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas. There may be an association with intact riparian habitat (particularly willows, cottonwoods, and sycamores).	May occur. The Plan Area contains potentially suitable roosting habitat for this species within dense foliage clusters.

Notes: CNDDB = California Natural Diversity Database; CEQA = California Environmental Quality Act

1 Legal Status Definitions

Federal:

FE Federally Listed as Endangered (legally protected)
FT Federally Listed as Threatened (legally protected)
FC Federal Candidate Species
FD Federally Delisted

State:

FP Fully protected (legally protected)
SSC Species of special concern (no formal protection other than CEQA consideration)
SE State Listed as Endangered (legally protected)
ST State Listed as Threatened (legally protected)
SC State Candidate for listing (legally protected)

2 Potential for Occurrence Definitions

Not expected to occur: Species is unlikely to be present because of poor habitat quality, lack of suitable habitat features, or restricted current distribution of the species.
May occur: Suitable habitat is available; however, there are little to no other indicators that the species might be present.
Known to occur: The species has been observed within the Plan Area.

Sources: Black and Vaughn 2005; CNDDB 2020; CCCI 2019b; CCCI 2019c; eBird 2020; USFWS 2009; USFWS 2010; USFWS 2020a; Xerces 2018

Sensitive Natural Communities

Sensitive natural communities are those native plant communities defined by CDFW as having limited distribution statewide or within a county or region and that are often vulnerable to environmental effects of projects (CDFW 2018). These communities may or may not contain special-status plants or their habitat (CDFW 2018). CDFW designates sensitive natural communities based on their state rarity and threat ranking using NatureServe's Heritage Methodology. Natural communities with rarity ranks of S1 to S3, where S1 is critically imperiled, S2 is imperiled, and S3 is vulnerable, are considered sensitive natural communities to be addressed in the environmental review processes of CEQA and its equivalents (CDFW 2018).

Sensitive natural communities are generally identified at the alliance level of vegetation classification hierarchy using the Manual of California Vegetation (Sawyer et al. 2009). Known occurrences of sensitive natural communities are included in the CNDDB; however, no new occurrences have been added to the CNDDB since the mid-1990s when funding was cut for this portion of the CNDDB program. Four sensitive natural communities were identified within the nine USGS quadrangles surrounding the Plan Area through a query of the CNDDB: northern coastal salt marsh, northern maritime chaparral, serpentine bunchgrass, and valley needlegrass grassland (CNDDB 2020). Additionally, surveys for sensitive natural communities were conducted within the Identified Treatment Project areas and other portions of the Plan Area in May of 2020 (CCCI 2020). None of the sensitive natural communities identified through a query of the CNDDB occur in the Identified Treatment Project areas; however, eight sensitive natural communities were observed and mapped: bigleaf maple forest, bush monkeyflower scrub, California bay forest, California buckeye grove, hazelnut scrub, madrone forest, ocean spray brush, and redwood forest (CCCI 2020). Of these, the following were observed within the Identified Treatment Project areas: bush monkeyflower scrub and California bay forest (CCCI 2020). Occurrences of sensitive natural communities recorded in the CNDDB and identified during May 2020 surveys are described in more detail below. Unless otherwise stated below, it is assumed that these sensitive natural communities may occur in portions of the Plan Area that have not been surveyed.

Northern Coastal Salt Marsh

Northern coastal salt marsh can contain pickleweed (*Salicornia* spp.), cordgrass (*Spartina* spp.), and saltgrass (*Distichlis spicata*). The nearest known occurrences of northern coastal salt marsh are approximately 4 miles southwest and 4.2 miles northwest of the Plan Area (CNDDB 2020). Salt marsh habitat is not present within the Plan Area, including the Identified Treatment Projects.

Northern Maritime Chaparral

Northern maritime chaparral habitat forms a nearly impenetrable shrub cover composed of several species of *Manzanita*, *Ceanothus*, and chamise (*Adenostoma fasciculatum*). The nearest known occurrences of northern maritime chaparral are approximately 2.5 miles southeast and 2.7 miles northeast of the Plan Area (CNDDB 2020). The Plan Area, including the Identified Treatment Projects, does not contain northern maritime chaparral habitat.

Serpentine Bunchgrass

Serpentine bunchgrass grassland is associated with serpentine soils and native bunchgrass species, such as serpentine reed grass (*Calamagrostis ophitidis*), blue wildrye (*Elymus glaucus*), blue fescue (*Festuca idahoensis*), June grass (*Koeleria macrantha*), Torrey melic (*Melica torreyana*), pine bluegrass (*Poa secunda*), big squirreltail grass (*Elymus multisetus*), and purple needlegrass (*Stipa pulchra*). The nearest known occurrences of serpentine bunchgrass is approximately 5 miles southeast of the Plan Area (CNDDB 2020). The Plan Area does not contain serpentine soils; thus, serpentine bunchgrass is not expected to occur and was not identified during May 2020 surveys of the Identified Treatment Project areas and other portions of the Plan Area.

Valley Needlegrass Grassland

Valley needlegrass grassland is associated with purple needle grass, nodding needle grass (*Stipa cernua*), other needlegrass species (*Stipa* spp.), and melic grass species (*Melica* spp.). The nearest known occurrence of valley needlegrass grassland is approximately 5.8 miles west of the Plan Area on Brooks Island (CNDDB 2020). California melic (*Melica californica*), Torrey's melic (*Melica torreyana*), foothill needle grass (*Stipa lepida*), and purple needle grass were observed within the Plan Area during special-status plant surveys in 2019 (CCCI 2019a). Habitat within the Plan Area where these species are present may qualify as a sensitive natural community based on the percentage of cover of the needlegrass and melic grass in proportion to other grass, forb, or shrub species. However, this sensitive natural community was not identified during May 2020 surveys of the Identified Treatment Project areas and other portions of the Plan Area.

California Bay Forest

California bay forest is typically dominated by California bay or co-dominated by California bay and other trees or tall shrubs (e.g., big-leaf maple, California buckeye, alder, madrone). California bay typically makes up more than 30 percent relative cover in the tree canopy, and conifers (e.g., gray pine [*Pinus sabiniana*]) typically make up less than

30 percent. California bay forest was identified within the Claremont FHR, Frowning FHR, Strawberry FHR, and East-West FB Identified Treatment Projects, as well as some additional portions of the Plan Area (CCCI 2020).

California Buckeye Grove

California buckeye groves are typically dominated by California buckeye trees, and are frequently associated with coast live oak, California bay, and toyon. California buckeye grove was identified within the Plan Area (CCCI 2020).

Bush Monkeyflower Scrub

Bush monkeyflower scrub is typically dominated by bush monkeyflower (also known as sticky monkeyflower). One occurrence of this sensitive natural community was observed within the East-West FB, totaling less than 0.1 acre (CCCI 2020). The Plan Area contains many occurrences of individual sticky monkeyflower shrubs; however, most these occurrences would not meet the qualifications of a sensitive natural community.

Bigleaf Maple Forest

Bigleaf maple forest is primarily associated with riparian environments, and the best developed stands are distributed near river terraces and adjacent side drainages. Bigleaf maple forest was identified within the Plan Area, associated with Strawberry Creek (CCCI 2020).

Redwood Forest

Redwood is typically the dominant species in redwood forest but may be co-dominant with other tree species (e.g., big-leaf maple, alder, madrone, California bay). Redwood typically makes up more than 50 percent relative cover in the tree canopy, with a lower tier of hardwood tree canopy cover.

Hazelnut Scrub

Hazelnut scrub is dominated by California hazelnut, and was identified in the Plan Area associated with coyote brush scrub and oak bay woodland habitat (CCCI 2020).

Madrone Forest

Madrone forest habitat is typically dominated by Pacific madrone and is also associated with California bay and coast live oak forests. Madrone forest habitat has been identified within the Plan Area (CCCI 2020).

Ocean Spray Brush

Ocean spray brush habitat is typically dominated by ocean spray shrubs. Ocean spray brush habitat was identified in the Plan Area, primarily along the edges of coyote brush scrub habitat (CCCI 2020).

Arroyo Willow Thickets

Arroyo willow is typically the dominant species in this community and can be co-dominant with other tall shrubs or low trees (e.g., big-leaf maple, coyote brush). Arroyo willow typically makes up more than 50 percent of the relative cover in the shrub or tree canopy. This sensitive natural community was not identified during May 2020 surveys of the Identified Treatment Project areas and other portions of the Plan Area.

Blue Elderberry Shrubland

Blue elderberry is dominant in the shrub canopy of this community and is found with other shrub species including California sagebrush, coyote brush, and sticky monkeyflower. Blue elderberry typically makes up more than 50 percent of the shrub overstory. This sensitive natural community was not identified during May 2020 surveys of the Identified Treatment Project areas and other portions of the Plan Area.

Federally and State Protected Wetlands and Other Waters

The Plan Area contains several known aquatic features, including riverine habitat within Strawberry Creek and Claremont Creek, other unnamed drainages associated with these watersheds, and two ponds within the UC Berkeley Botanical Garden (Figure 3.5-1). Several drainages associated with Strawberry Creek and Claremont Creek run through the Strawberry FHR, Frowning FHR, Claremont FHR, Hearst Gate FB, and TRA 1 Identified Treatment Projects (Figure 3.5-1). Although no formal delineation has been conducted, these features are hydrologically connected to the San Francisco Bay/Pacific Ocean and would therefore be regulated by the U.S. Army Corps of Engineers under the federal Clean Water Act. Additionally, these features and associated habitat are likely waters of the state and/or under the regulatory authority of CDFW pursuant to California Fish and Game Code 1600 et seq.

Critical Habitat

Critical habitat is defined in the federal ESA as specific geographic areas that contain features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. Given the large scale at which critical habitat is mapped, it may also include areas that are not suitable for a species and would not be occupied. The Plan Area contains approximately 606.5 acres of designated Alameda whipsnake critical habitat, which encompasses most of the undeveloped portion of the Plan Area.

A critical habitat designation only affects activities performed by federal agencies or that involve a federal permit, license, or funding, and that are likely to destroy or adversely affect the area of critical habitat. UC Berkeley, as a state agency, is not required to consult with USFWS for nonfederal actions within critical habitat. In this EIR, critical habitat is provided for informational purposes and to highlight the importance this area may have to the recovery of Alameda whipsnake.

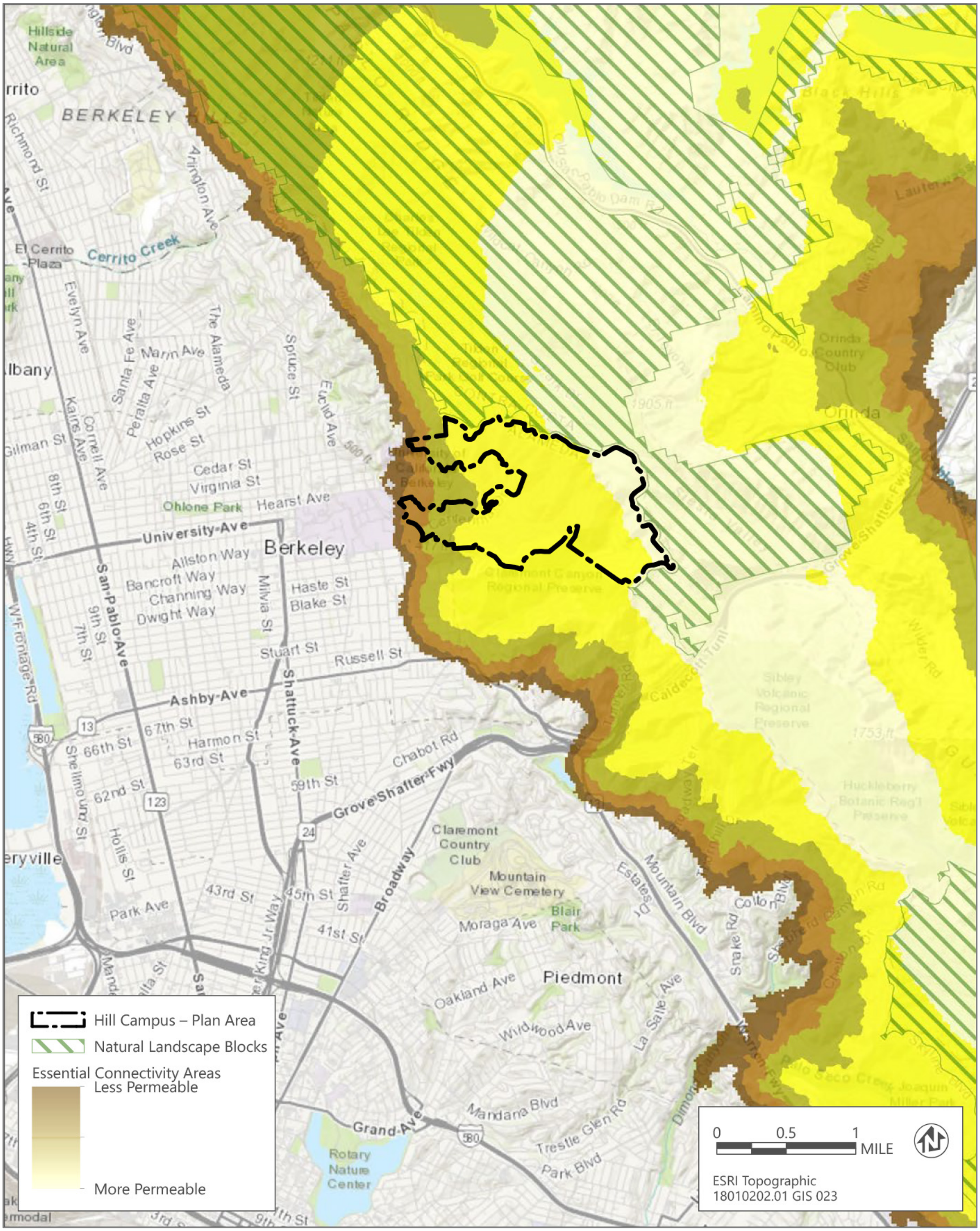
Wildlife Movement Corridors

The Plan Area is predominately composed of relatively intact natural habitat, including woodland, scrub, and grassland habitat (Figure 3.5-1). Two creeks, Strawberry Creek and Claremont Creek, and several other drainages run through the Plan Area. These features likely provide value as movement corridors for terrestrial and aquatic wildlife species and also provide connectivity with other natural habitats, especially to the east of the Plan Area.

Some of the important areas for habitat connectivity in California were mapped as Essential Connectivity Areas (ECA) for the California Essential Habitat Connectivity Project, which was commissioned by the California Department of Transportation and CDFW with the purpose of making transportation and land-use planning more efficient and less costly, while helping reduce dangerous wildlife-vehicle collisions (Spencer et al. 2010). The ECAs were not developed for the purposes of defining areas subject to specific regulations by CDFW or other agencies. As shown in Figure 3.5-2, the Plan Area is surrounded on the north, east, and south by areas characterized as natural landscape blocks. The Plan Area itself is considered an ECA, providing connectivity between these natural landscape blocks, and is generally “more permeable” relative to other areas outside of natural landscape blocks (see Figure 3.5-2).

Wildlife Nursery Sites

Nursery sites are locations where fish and wildlife concentrate for hatching and/or raising young, such as nesting rookeries for birds, spawning areas for native fish, fawning areas for deer, and maternal roosts for bats. In this EIR, nursery sites are considered for native wildlife. The Plan Area and Identified Treatment Project Areas could contain a variety of wildlife nursery sites. For example, herons and egrets will nest communally in rookeries that may contain a few to hundreds of pairs of birds. Fawning areas also have the potential to occur in undeveloped areas of the Plan Area and Identified Treatment Project areas. For example, mule deer (*Odocoileus hemionus*) occur in shrub, woodland, and riparian habitats and could use these areas for fawning habitat. Bat maternity roost sites could also be found within suitable habitat in the Plan Area and Identified Treatment Project areas. Roost sites depend on the bat species, but may include specialized roosting habitat, such as caves or tree foliage, or a bat species may use multiple different habitat types for maternity roosts. Other roosting habitat includes buildings, bridges, and other built structures; cliffs including rock crevices and cracks; rip-rap; and tree hollows. The Plan Area and Identified Treatment Project areas may also include habitat for overwintering monarchs (*Danaus plexippus*) within tree stands, including eucalyptus stands.



Source: data downloaded from University of California, Berkeley in 2019 and CDFW in 2017

Figure 3.5-2 Essential Connectivity Areas and Natural Landscape Blocks in the Plan Area

3.5.2 Regulatory Setting

The regulations identified below are applicable at the program and project level, unless otherwise noted.

FEDERAL

Federal Endangered Species Act

Pursuant to the federal ESA (16 U.S.C. Section 1531 et seq.), USFWS regulates the taking of species listed in the ESA as threatened or endangered. In general, persons subject to ESA (including private parties) are prohibited from "taking" endangered or threatened fish and wildlife species on private or government-owned property, and from "taking" endangered or threatened plants in areas under federal jurisdiction or in violation of state law. Under Section 9 of the ESA, the definition of "take" is to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." USFWS has also interpreted the definition of "harm" to include significant habitat modification that could result in take.

Section 10 of the ESA applies if a non-federal agency is the lead agency for an action that results in take and no other federal agencies are involved in permitting the action. Section 7 of the ESA applies if a federal discretionary action is required (e.g., a federal agency must issue a permit), in which case the involved federal agency consults with USFWS.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA), first enacted in 1918, provides for protection of international migratory birds and authorizes the Secretary of the Interior to regulate the taking of migratory birds. The MBTA provides that it will be unlawful, except as permitted by regulations, to pursue, take, or kill any migratory bird, or any part, nest, or egg of any such bird. Under the MBTA, "take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or any attempt to carry out these activities." A take does not include habitat destruction or alteration, as long as there is not a direct taking of birds, nests, eggs, or parts thereof. The current list of species protected by the MBTA can be found in Title 50 of the Code of Federal Regulations (CFR), Section 10.13 (50 CFR 10.13). The list includes nearly all birds native to the United States.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act, enacted in 1940 and amended multiple times since, prohibits the taking of bald and golden eagles without a permit from the Secretary of the Interior. Similar to the ESA, the Bald and Golden Eagle Protection Act defines "take" to include "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" (16 U.S. Code 668–668c). For the purpose of the act, disturbance that would injure an eagle, decrease productivity, or cause nest abandonment, including habitat alterations that could have these results, are considered take and can result in civil or criminal penalties.

STATE

California Endangered Species Act

Pursuant to the CESA, a permit from CDFW is required for projects that could result in the "take" of a plant or animal species that is listed by the state as threatened or endangered. Under CESA, "take" is defined as an activity that would directly or indirectly kill an individual of a species but does not include "harm" or "harass," as does the federal definition. As a result, the threshold for take is higher under CESA than under the federal ESA. Authorization for take of state-listed species can be obtained through a California Fish and Game Code Section 2081 incidental take permit.

California Fish and Game Code Sections 3503 and 3503.5—Protection of Bird Nests and Raptors

Section 3503 of the Fish and Game Code states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. Section 3503.5 of the California Fish and Game Code states that it is unlawful to take, possess, or destroy any raptors (i.e., species in the orders *Falconiformes* and *Strigiformes*), including their nests or eggs. Typical violations include destruction of active nests as a result of tree removal or disturbance caused by project implementation or other activities that cause the adults to abandon the nest, resulting in loss of eggs and/or young.

Fully Protected Species under the California Fish and Game Code

Protection of fully protected species is described in Sections 3511, 4700, 5050, and 5515 of the California Fish and Game Code. These statutes prohibit take or possession of fully protected species and do not provide for authorization of incidental take.

Native Plant Protection Act

The Native Plant Protection Act (NPPA) (California Fish and Game Code Section 1900 et seq.) allows the California Fish and Game Commission to designate plants as rare or endangered. Sixty-four species, subspecies, and varieties of plants are protected as rare under the NPPA. The act prohibits take of endangered or rare native plants but includes exceptions for agricultural and nursery operations; for emergencies; and, after proper notification of CDFW, for vegetation removal from canals, roads, and other building sites, changes in land use, and other situations.

Section 1602 of the California Fish and Game Code

All diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake in California that supports wildlife resources are subject to regulation by CDFW under Section 1600 et seq. of the California Fish and Game Code. Under Section 1602, it is unlawful for any person to substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake designated by CDFW, or use any material from the streambeds, without first notifying CDFW of such activity and obtaining a final agreement authorizing such activity. CDFW's jurisdiction in altered or artificial waterways is based on the value of those waterways to fish and wildlife.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Act requires that each of the nine Regional Water Quality Control Boards prepare and periodically update basin plans for water quality control. Each basin plan sets forth water quality standards for surface water and groundwater and actions to control nonpoint and point sources of pollution to achieve and maintain these standards. Basin plans offer an opportunity to protect wetlands through the establishment of water quality objectives. The Regional Water Quality Control Boards' jurisdiction includes waters of the United States, as well as areas that meet the definition of "waters of the state." "Waters of the state" is defined as any surface water or groundwater, including saline waters, within the boundaries of the state. The Regional Water Quality Control Boards have the discretion to take jurisdiction over areas not federally protected under CWA Section 404 provided they meet the definition of waters of the state. The State Water Resources Control Board published a new set of procedures for discharges of dredged or fill material into waters of the state on March 22, 2019. Mitigation requiring no net loss of wetlands functions and values of waters of the state typically is required.

LOCAL

As a constitutionally-created state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies. Following the relevant policies of the UC Berkeley 2020 LRDP, relevant local regulations are summarized below.

UC Berkeley 2020 LRDP

The UC Berkeley 2020 LRDP contains the following policies related to biological resources that are applicable to the WVFMP:

- Implement an ongoing program of investment to restore and renew the campus park landscape.
- Establish a management authority for the Ecological Study Area.

- 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.

Alameda County General Plan

The Conservation Element of the Alameda County General Plan contains the following goals and objectives related to biological resources that are applicable to the WVFMP (Alameda County 1994a):

Vegetative and Wildlife Resources

GOAL: To protect and enhance wildlife habitats and natural vegetation areas in Alameda County.

- **Objective 1:** To identify areas of critical or sensitive concern for wildlife and vegetation.
- **Objective 2:** To maintain and, if necessary, restore deteriorating environments to a level of diversity appropriate in this area of California.
- **Objective 3:** To identify the principles of resource management as criteria for resource evaluation.
- **Objective 4:** To educate government, business and citizens to conserve and protect wildlife resources.

The Conservation Element of the Alameda County General Plan contains the following goals and objectives related to biological resources that are applicable to the WVFMP (Alameda County 1994b):

- **Objective:** To provide a continuous system of open space for the preservation, enhancement, and protection of natural scenic features and preservation and protection of watershed and wildlife areas and agricultural areas.
  - **Principle: Include Existing, Potential, and Depleted Wildlife Habitats.** Existing and potential marine and wildlife habitats should be preserved in a natural, undeveloped state as part of the open space plan, as a means of preserving and attracting wildlife. Depleted habitats adaptable to restoration should also be included as open space. All habitats should be established as sanctuaries or refuges and closed to the public, except for ecological study in selected areas.
  - **Principle: Natural Resources within Open Space Areas Should Be Permanently Protected.** Within open space areas, either publicly or privately owned, removal of mature trees should not be permitted without the permission of the local authority. Alteration of streambeds or bodies of water and adjacent vegetation should be permitted only as a means of erosion of flood control, as permitted by the adopted plans of regional or local jurisdictions, and in such a manner to enhance water courses, scenic shoreline and marshlands within the county.
  - **Principle: Protect Open Space Areas from Hazards of Fire.** Effort should be made by private citizens and government to protect vegetation and wildlife from the hazards of uncontrolled burning of woodland and grass areas. Burned out areas should be seeded.

Contra Costa County General Plan

The Conservation Element of the Contra Costa County General Plan contains the following goals and policies related to biological resources that are applicable to the WVFMP (Contra Costa County 2005):

Overall Conservation

GOAL 8-A: To preserve and protect the ecological resources of the County.

GOAL 8-B: To conserve the natural resources of the County through control of the direction, extent and timing of urban growth.

GOAL 8-C: To achieve a balance of uses of the County's natural and developed resources to meet the social and economic needs of the County's residents.

- **Policy 8-1:** Resource utilization and development shall be planned within a framework of maintaining a healthy and attractive environment.
- **Policy 8-3:** Watersheds, natural waterways, and areas important for maintenance of natural vegetation and wildlife populations shall be preserved and enhanced.

<u>Vegetation and Wildlife</u>

GOAL 8-D: To protect ecologically significant lands, wetlands, plant and wildlife habitats.

GOAL 8-E: To protect rare, threatened and endangered species of fish, wildlife and plants, significant plant communities, and other resources which stand out as unique because of their scarcity, scientific value, aesthetic quality or cultural significance. Attempt to achieve a significant net increase in wetland values and functions within the County over the life of the General Plan. The definition or rare, threatened and endangered includes those definitions provided by the Federal Endangered Species Act, the California Endangered Species Act, the California Native Plant Protection Act and the California Environmental Quality Act.

- **Policy 8-6:** Significant trees, natural vegetation, and wildlife populations generally shall be preserved.
- **Policy 8-7:** Important wildlife habitats which would be disturbed by major development shall be preserved, and corridors for wildlife migration between undeveloped lands shall be retained.
- **Policy 8-8:** Significant ecological resource areas in the County shall be identified and designated for compatible low-intensity land uses. Setback zones shall be established around the resources areas to assist in their protection.
- **Policy 8-9:** Areas determined to contain significant ecological resources, particularly those containing endangered species, shall be maintained in their natural state and carefully regulated to the maximum legal extent. Acquisition of the most ecologically sensitive properties within the County by appropriate public agencies shall be encouraged.
- **Policy 8-12:** Natural woodlands shall be preserved to the maximum extent possible in the course of land development.
- **Policy 8-13:** The critical ecological and scenic characteristics of rangelands, woodlands, and wildlands shall be recognized and protects.
- **Policy 8-15:** Existing vegetation, both native and non-native, and wildlife habitat areas shall be retained in the major open space areas sufficient for the maintenance of a healthy balance of wildlife populations.
- **Policy 8-22:** Applications of toxic pesticides and herbicides shall be kept at a minimum and applied in accordance with the strictest standards designed to conserve all living resources of the County. The use of biological and other non-toxic controls shall be encouraged.
- **Policy 8-25:** The County shall protect marshes, wetlands, and riparian corridors from the effects of potential industrial spills.
- **Policy 8-28:** Efforts shall be made to identify and protect the county’s mature native oak, bay, and buckeye trees.

City of Berkeley General Plan

The Environmental Management Element of the City of Berkeley General Plan contains the following objectives and policies related to biological resources that are applicable to the WVFMP (City of Berkeley 2001):

Objective 1: Protect, maintain, and enhance the urban forest (including street and park trees) and natural habitat areas.

- **Policy EM-31 Inter-Jurisdictional Coordination**: Encourage efforts by neighboring jurisdictions and agencies, such as the East Bay Regional Park District, the University of California at Berkeley, and the Lawrence Berkeley National Laboratory, to restore historic coastal grasslands and native trees in the hill area to provide natural habitat and reduce fire danger in the area.

City of Oakland General Plan

The Open Space, Conservation, and Recreation Element of the City of Oakland General Plan contains the following objectives and policies related to biological resources that are applicable to the WVFMP (City of Oakland 1998):

Objective OS-1 Resource Conservation Areas: To conserve and appropriately manage undeveloped areas in Oakland which have high natural resource value, scenic value, or natural hazards which preclude safe development.

- Policy OS-1.1 Wildland Parks: Conserve existing City and Regional Parks characterized by steep slopes, large groundwater recharge areas, native plant and animal communities, extreme fire hazards, or similar conditions. These areas are included in Figure 4 as Potential Resource Conservation Areas. Manage such areas to protect public health and safety and conserve natural resources.
- Policy OS-1.2 Open Space Protection Priorities for Private Land: Conserve privately-owned areas with important natural resource values through a combination of land acquisition and development controls. Use the following criteria when developing priorities for acquisition or protection.
  - a) steep hillside parcels over 10 acres in size;
  - b) parcels with significant biological resources, including endangered species habitat and native plant communities;
  - c) parcels which can potentially link together or expand existing open space areas;
  - d) visually prominent properties, including ridgelines and other areas with high scenic value; and
  - e) properties where the use of eminent domain is not required.

Objective CO-6 Surface Waters: To protect the ecology and promote the beneficial uses of Oakland's creeks, lakes, and nearshore waters.

- Policy CO-6.1 Creek Management: Protect Oakland's remaining natural creek segments by retaining creek vegetation, maintaining creek setbacks, and controlling bank erosion. Design future flood control projects to preserve the natural character of creeks and incorporate provisions for public access, including trails, where feasible. Strongly discourage projects which bury creeks or divert them into concrete channels.

Objective CO-7 Protection of Native Plant Communities: To minimize the loss of native plant communities and restore these communities where they have been damaged or lost, and to preserve Oakland's trees unless there are compelling safety, ecological, public safety, or aesthetic reasons for their removal.

- Policy CO-7.1 Protection of Native Plant Communities: Protect native plant communities, especially oak woodlands, redwood forests, native perennial grasslands, and riparian woodlands, from the potential adverse impacts of development. Manage development in a way which prevents or mitigates adverse impacts to these communities.
- Policy CO-7.2 Native Plant Restoration: Encourage efforts to restore native plant communities in areas where they have been compromised by development or invasive species, provided that such efforts do not increase an area's susceptibility to wildfire.
- Policy CO-7.3 Forested Character: Make every effort to maintain the wooded or forested character of tree-covered lots when development occurs on such lots.
- Policy CO-7.4 Tree Removal: Discourage the removal of large trees on already developed sites unless removal is required for biological, public safety, or public works reasons.
- Policy CO-7.5 Non-native Plant Removal: Do not remove non-native plants within park and open space areas solely because they are non-natives. Plant removal should be related to other valid management policies, including fire prevention.

Objective CO-9 Rare, Endangered, and Threatened Species: To protect rare, endangered, and threatened species from the impacts of urbanization.

- **Policy CO-9.1 Habitat Protection**: Protect rare, endangered, and threatened species by conserving and enhancing their habitat and requiring mitigation of potential adverse impacts when development occurs within habitat areas.

Objective CO-11 Wildlife: To sustain a healthy wildlife population within the City of Oakland.

- **Policy CO-11.1 Protection from Urbanization**: Protect wildlife from the hazards of urbanization, including loss of habitat and predation by domestic animals.
- **Policy CO-11.2 Migratory Corridors**: Protect and enhance migratory corridors for wildlife. Where such corridors are privately owned, require new development to retain native habitat or take other measures which help sustain local wildlife population and migratory patterns.

3.5.3 Impact Analysis and Mitigation Measures

ANALYSIS METHODOLOGY

This impact evaluation is based on review of existing databases that address biological resources in the vicinity of the Plan Area, aerial photographs, and several reports regarding biological resource surveys in the Plan Area and specific to the Identified Treatment Projects, as described above. The impact evaluation focuses on the potential for impacts on special-status species, sensitive natural communities, state or federally-protected wetlands, migratory wildlife corridors, or native wildlife nursery sites, or local policies or ordinances or conservation plans. Significance determinations account for the influence of relevant Environmental Protection Measures (EPMs), which are incorporated into treatment design. The full text of EPMs is presented in Section 2.6, "Environmental Protection Measures."

Among other factors, the determination of impacts includes an evaluation of whether treatments under the WVFMP and Identified Treatment Projects could result in a loss of habitat function. Maintenance of habitat function is one of the performance standards for mitigation. Habitat function is defined here as the arrangement and capability of habitat features to provide refuge, foraging, and reproduction habitat to plants and animals, and thereby contribute to the conservation of biological and genetic diversity and evolutionary processes (de Groot et al. 2002). Some modification of habitat characteristics may occur without causing a significant effect, provided that habitat function is maintained (i.e., the location, essential habitat features, and species supported are not substantially changed). Essential habitat features are those that provide food, water, shelter, living space, breeding areas or substrates, and nursery areas to the species that reside in or migrate through the habitat type.

For the program-level analysis of the overall WVFMP, it is assumed that an average of 200 acres per year would be treated in the Plan Area in locations determined by wildfire risk reduction priorities as well as landscape and vegetation conditions. The specific location of the proposed Identified Treatment Projects are known. Impact acreages were identified for each Identified Treatment Project by overlaying the project boundaries on the vegetation communities layer (Figure 3.5-1, Table 3.5-1) and are provided in Table 3.5-4. These impact acreages are referenced in the impact analysis for certain special-status species to describe potential adverse effects resulting from implementation of Identified Treatment Projects.

Table 3.5-4 Impact Acreage for Natural Vegetation Communities in the Plan Area from Identified Treatment Projects

Identified Treatment Project	Oak-Bay Woodland	Scrub	Eucalyptus Forest	Coniferous Forest	Riverine	Successional Grassland	Total Impact Acreage by Project[1]
Claremont Canyon Fire Hazard Reduction	1.28	0.60	23.62	—	0.24 mile	—	**25.5**
Frowning Ridge Fire Hazard Reduction	3.65	4.75	28.12	11.83	1.13 miles	0.86	**49.2**
Strawberry Canyon Fire Hazard Reduction	0.25	0.41	21.25	0.03	0.16 mile	1.11	**23.1**
Fire Trail Access Road	—	—	0.11	—	0.01 mile	0.01	**0.12**
East-West Fuel Break	1.48	4.50	3.98	8.83	—	1.66	**20.5**
Hearst Gate Fuel Break	—	—	1.21	—	—	0.02	**1.2**
Temporary Refuge Area 1	0.04	0.02	—	—	0.02 mile	0.04	**0.10**
Temporary Refuge Area 2	0.32	0.09	0.18	—	—	—	**0.59**
Temporary Refuge Area 3	—	0.15	0.44	—	—	0.01	**0.62**
Temporary Refuge Area 4	—	—	—	—	—	—	**0.00**
Total Impact Acreage by Vegetation Community	**7.02**	**10.52**	**79.01**	**20.69**	**1.56 miles**	**3.81**	**120.87**

Source: Data compiled by Ascent Environmental in 2020.

[1]The total acreage of Identified Treatment Projects is 123.1 acres (refer to Table 2-3 in Chapter 2, "Project Description"). The acreage of vegetation communities within the Identified Treatment Projects is slightly less than the total treatment acreage because developed areas (e.g., paved lots, roads) within Identified Treatment Projects are not included in this table.

SIGNIFICANCE CRITERIA

An impact on biological resources is considered significant if implementation of the WVFMP would do any of the following:

- have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS;
- have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by CDFW or USFWS;
- have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
- 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;
- conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; and/or
- conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

ISSUES NOT DISCUSSED FURTHER

Consistency with Habitat Conservation Plans

The Plan Area does not overlap any adopted Habitat Conservation Plan (HCP) or Natural Community Conservation Plan (NCCP). Therefore, Plan implementation would not conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or state HCP. This issue is not discussed further.

IMPACT ANALYSIS

Impact BIO-1: Substantially Affect Special-Status Plant Species Either Directly or Through Habitat Modifications

Vegetation treatment activities could result in direct removal or destruction, or indirect death or reduced vigor of special-status plants through habitat modifications. EPMs would minimize impacts; however, treatment activities could inadvertently damage or destroy special-status plants and adversely modify their habitat resulting in reduced growth and reproduction or death and loss of special-status plant occurrences. Because the loss of special-status plants could substantially affect the abundance, distribution, and viability of local and regional populations of these species, this would be a **significant** impact for the overall WVFMP as well as the Identified Treatment Projects.

<u>Overall WVFMP (Program-level Analysis)</u>

Table 3.5-2 provides a list of the special-status plant species that may occur within the Plan Area. One special-status species, western leatherwood (*Dirca occidentalis*), has been identified during previous special-status plant surveys conducted within portions of the Plan Area (CCCI 2016; CCCI 2019a, Appendix E1). Twenty-two additional special-status plant species may occur within the Plan Area (Table 3.5-2):

- Bent-flowered fiddleneck (*Amsinckia lunaris*)
- Pallid manzanita (*Arctostaphylos pallida*)
- Big-scale balsamroot (*Balsamorhiza macrolepis*)
- Big tarplant (*Blepharizonia plumose*)
- Mt. Diablo fairy-lantern (*Calochortus pulchellus*)
- Bristly sedge (*Carex comosa*)
- Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*)
- Franciscan thistle (*Cirsium andrewsii*)
- Minute pocket moss (*Fissidens pauperculus*)
- Fragrant fritillary (*Fritillaria liliacea*)
- Diablo helianthella (*Helianthella castanea*)
- Congested-headed hayfield tarplant (*Hemizonia congesta* ssp. *congesta*)
- Northern California black walnut (*Juglans hindsii*)
- Hall's bush-mallow (*Malacothamnus hallii*)
- Oregon meconella (*Meconella oregana*)
- Mt. Diablo cottonweed (*Micropus amphiboles*)
- San Antonio Hills monardella (*Monardella antonina* ssp. a*ntonina*)
- Woodland woollythreads (*Monolopia gracilens*)
- Choris' popcornflower (*Plagiobothrys chorisianus* var. *chorisianus*)
- San Francisco popcornflower (*Plagiobothrys diffusus*)
- Adobe sanicle (*Sanicula maritima*)
- Oval-leaved viburnum (*Viburnum ellipticum*)

The proposed treatment activities could result in death, altered growth, or reduced seed set through physically breaking, crushing, burning, scorching, trampling, or uprooting special-status plants. Any of the treatment activities have the potential to kill or damage special-status plants, if present within a treatment area, and each of the treatment activities could be used in every treatment type.

Treatment activities could also alter growth and reproduction of special-status plants through habitat modifications. An indirect impact would occur if ground disturbance during treatment activities altered habitat or site conditions in a manner that later resulted in the death or lack of regeneration of special-status plants. Treatment activities could disrupt ecosystem, community, or population structure or processes in ways that reduce growth, survival, and reproduction of special-status plants. Habitat alteration could make the habitat conditions unsuitable to support special-status plants in the long term.

Special-status plant species may indirectly benefit from the removal of invasive, nonnative species (e.g., eucalyptus, Monterey pine, French broom), as habitats dominated by these species would be converted to more native-dominated habitats with coast live oak, California bay, and native scrub. Treatment activities would open up the canopy where tree or shrub densities are uncharacteristic of healthy or desired examples of the native vegetation type and could result in both immediate and long-term benefits to some special-status plant species through improved habitat conditions.

EPM BIO-1 would require all material stockpiling and staging areas to be located within designated landings outside of sensitive habitats, which would reduce the likelihood of inadvertent burying or trampling of special-status plants. EPM BIO-2 would require measures to reduce the likelihood of the spread or introduction of exotic plant species that may threaten special-status plants; including minimization of soil disturbance; use of native plants seeds or stock for erosion control; and the use of signs, fencing, or other measures to promote the ecological health of a treatment area. EPM BIO-4 would require Environmental Awareness Training for all staff involved with vegetation treatment activities, and this training would include the identification and relevant life history information for special-status plants and habitats that may potentially occur within a treatment area and describe the work practices necessary to effectively implement the EPMs and mitigation measures. EPM BIO-5 would require delineation of treatment areas and restriction of access outside of the treatment area to prevent impacts on sensitive biological resources, including special-status plants. EPM BIO-6 would require the use of existing roads, trails, and former logging paths to minimize ground disturbance from equipment and vehicles, which would further protect special-status species, if present within a treatment area. EPM HYD-2 includes provisions for the use of herbicides in the vicinity of aquatic habitat or riparian areas, including spill prevention, avoidance of herbicide use during precipitation events, and using only herbicides labeled for use in aquatic environments when working in riparian habitats. Finally, EPM HAZ-5 would prohibit spray applications of herbicides when wind speeds are 7 miles per hour or greater and requires the use of low-pressure spray nozzles kept within 24 inches of the target vegetation to reduce the risk of herbicide drift.

Manual Vegetation Treatment

Manual treatment activities would include the use of hand tools (e.g., shovels, Pulaski hoes, McLeod fire tools, machetes, pruning shears, weed whips, weed wrenches, hand saws) and hand-operated power tools (e.g., chainsaws, mechanized brush cutters) to hand pull, thin, prune, and lop vegetation. Manual treatments typically result in less ground disturbance than mechanical treatments and therefore have a lower risk of damaging or removing special-status plants that may be present in proposed treatment areas. Special-status plants may be trampled by workers, damaged if growing beneath debris piles, or inadvertently removed if not identified for avoidance prior to treatment.

Mechanical Vegetation Treatment

Mechanical treatment activities would include masticating, cutting, chipping, raking, grading, tilling, mowing, and chopping existing vegetation, using motorized equipment (e.g., feller buncher, yarder, skidder, masticator, tractor, brush cutter, grapple saw). In comparison to other treatment activities, mechanical treatments have the greatest potential to harm special-status plants. Masticating, tilling, grubbing, and raking can disturb soil several inches below the surface affecting roots, rhizomes, bulbs and other underground parts of special-status plants, as well as the seedbed, and can also affect soil stability. In addition, the removal of vegetation using mechanical treatments is less precise (in comparison to manual treatments); therefore, this treatment activity is used at sites where precision removal is not necessary. Mechanical treatments in areas occupied by special-status plants would likely directly kill or damage these plants. This treatment activity would also have the greatest potential to adversely modify habitat in a way that reduces survivorship, growth, and reestablishment of special-status plant populations because of the large-scale vegetation removal and soil disturbance.

Prescribed Broadcast Burning

Prescribed broadcast burning would include the intentional application of fire as well as installation of fire containment lines around a burn area. Prescribed broadcast burning could result in directly igniting, scorching, or wilting special-status plants or their propagules if prescribed fire is close to special-status plant populations. Prescribed broadcast burns could consume special-status plants completely or could scorch, singe, or wilt parts of plants, adversely affecting their growth and reproduction but not immediately killing or consuming them. In addition, prescribed broadcast burning could destroy or reduce the viability of seedbanks of special-status plant species if they are not adapted to fire or if the fire burns too hot for the seedbank to tolerate.

Managed Herbivory

Managed herbivory would include the use of domestic livestock (e.g., cows, goats, sheep) to reduce a target plant population and/or biomass of a class of vegetation (herbaceous plants and/or shrubs). Special-status plants could be consumed or trampled by grazing livestock resulting in their death or reduced reproduction and growth. Special-status plants could also be inadvertently crushed, trampled, broken or otherwise damaged during installation or removal of fencing used to contain the animals. Managed herbivory is typically used on a relatively small scale to reduce a target plant population, such as an invasive plant infestation, thereby reducing fire fuels or competition with desirable (e.g., more fire resistant) plant species.

Herbicide Application

Application of herbicides during treatment could damage or kill special-status plants through inadvertent direct application or through herbicide drift. For example, some herbicides can drift up to 68 feet from the target during application at wind speeds of 15 miles per hour (USFS 2015). Herbicides may drift to nontarget areas through spray particle drift or vapor drift to foliage of special-status plants, and herbicide-contaminated soil may affect underground roots, rhizomes, or bulbs of special-status plant species. The risk of herbicide damage to special-status plants depends on the plant species affected, which herbicide is used, and the application rate and treatment method used. For example, downward spray application and spot spraying methods have a greater risk of affecting nontarget species than stem injection or paint-on stem application. Herbicide application under the WVFMP and Identified Treatment Projects would be achieved using targeted methods, including paint-on stem application and hand spray methods. These methods are more precise than other application methods (e.g., aerial spray) and would limit inadvertent application of herbicides on non-target vegetation. Additionally, as presented in Table 2.2 in Section 2, "Project Description," four of the six herbicides proposed for use are selective, which would reduce the risk of effects on non-target vegetation.

Biomass Disposition

Several biomass disposition activities are relevant to biological resource impacts, including pile burning, spreading of chipped or masticated vegetation onsite, and leaving cut logs onsite. Additionally, pile burning could result in adverse effects on special-status plants and habitat if the piles are placed on or near these plants. Spreading of chipped vegetation or piling of cut logs could also result in adverse effects on special-status plants if the treated vegetation is spread or piled on individual plants, resulting in crushing of these plants.

Access Roads and Landings

Implementation of treatment activities under the WVFMP would include the use of existing access roads and landings. No new landings or access roads would be constructed under the WVFMP; however, some minor regrading and clearing to reestablish existing landings and an access road would be required. Grading for the access road would occur within 0.3 acre of an existing fire trail in the Plan Area to enable 4WD vehicle passage. Grading or staging of equipment and materials in areas occupied by special-status plants could directly kill or damage these plants. Given the small extent of these areas and their previously disturbed nature, adverse habitat modification would not occur.

Treatment Maintenance and Monitoring

Follow-up maintenance and monitoring of treated areas would be implemented to retain the benefits of initial vegetation treatments. Post-treatment monitoring would be conducted immediately following vegetation treatments and on an annual basis to inform ongoing maintenance strategies. Maintenance treatments could be different than the original treatment used in the area but would not include any new treatment activities not discussed above.

<u>Summary</u>

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on special-status plants. However, even with implementation of the EPMs, treatments implemented in areas occupied by special-status plants could result in direct removal of special-status plants or habitat modifications that lead to reduced growth and reproduction or death and loss of special-status plant occurrences. Additionally, pile burning could result in adverse effects on special-status plants and habitat if the piles are placed on or near these plants. Similarly, placement of wood chips within a treatment area after treatment could result in adverse effects on special-status plants if the wood chips cover these plants. Because the loss of special-status plants could substantially affect the abundance, distribution, and viability of local and regional populations of affected species, this would be a **significant** impact.

Implementation of the WVFMP would likely result in a long-term benefit to special-status plants because it would reduce the risk of catastrophic wildfires that can eliminate special-status plant populations and otherwise damage or degrade special-status plants. However, given the unpredictability of wildfire, in terms of location and severity, evaluating the specific benefits to biological resources is not feasible and is not considered in determining the significance of this impact under CEQA.

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

During the early planning stages of later treatment projects implemented under the WVFMP, the following measure will apply:

- A data review and biological reconnaissance survey will be conducted within the treatment area by a qualified biologist prior to initial treatment and treatment maintenance and will be conducted no more than one year prior to the implementation of treatment or maintenance. The qualified biologist must be familiar with the life histories and ecology of species in the San Francisco Bay Area and must have experience conducting field surveys of relevant species or resources, including protocol-level surveys for individual species, if applicable. The data reviewed will include the biological resources setting, species tables, and habitat information in this EIR. It will also include review of the best available, current data for the area, including vegetation mapping data, species distribution/range information, CNDDB, CNPS Inventory of Rare and Endangered Plants of California, relevant Biogeographic Information and Observation System (BIOS) queries, and relevant general and regional plans. BIOS is a web-based system that enables the management and visualization of biogeographic data collected by CDFW and partner organizations. The qualified biologist will assess the habitat suitability of the treatment area for all special-status plant and wildlife species as well as sensitive habitats identified as having potential to occur in the Plan Area (refer to Section 3.5.1, "Environmental Setting"), and will identify any wildlife nursery sites (e.g., heron rookeries, bat maternity roosts, monarch overwintering colonies) within the Plan Area. The biologist will provide a letter report to UC Berkeley with evidence to support a conclusion as to whether special-status species and sensitive habitats are present or are likely to occur within the treatment area.
- If the reconnaissance survey identifies no potential for special-status plant, wildlife species, or sensitive habitats to occur, UC Berkeley will not be required to apply any additional mitigation measures under Impact BIO-1 through BIO-4.
- If the qualified biologist determines that there is potential for special-status species or sensitive habitats to be present within the treatment area, the appropriate biological mitigation measures, identified below, will be implemented.

Mitigation Measure BIO-1b: Conduct Special-Status Plant Surveys and Implement Avoidance Measures and Mitigation

If it is determined that suitable habitat for special-status plant species is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a) the following measures will be implemented:

- Prior to implementation of treatment activities and during the blooming period for the special-status plant species with potential to occur in the treatment area (see table below), as determined during implementation of Mitigation Measures BIO-1a, a qualified botanist will conduct protocol-level surveys for special-status plants within the treatment area following survey methods from CDFW's Protocols for Surveying and Evaluating Impacts on Special Status Native Plant Populations and Natural Communities (CDFW 2018). The qualified botanist will 1) be knowledgeable about plant taxonomy, 2) be familiar with plants of the San Francisco Bay Area region, including special-status plants and sensitive natural communities, 3) have experience conducting floristic botanical field surveys as described in CDFW 2018, 4) be familiar with the *California Manual of Vegetation* (Sawyer et al. 2009 or current version, including updated natural communities data at http://vegetation.cnps.org/), and 5) be familiar with federal and state statutes and regulations related to plants and plant collecting.

- If protocol-level surveys, consisting of at least two survey visits (e.g., early blooming season and later blooming season) during a normal weather year, have been completed in the 5 years before implementation of the treatment project and no special-status plants were found, and no treatment activity occurred after the protocol-level survey, treatment may proceed in that area without additional plant surveys.

- If special-status plants are not found, the botanist will document the findings in a letter report to UC Berkeley and no further mitigation will be required.
- If special-status plant species are found, the plant will be avoided completely, if feasible (i.e., project objectives can still be met). This may include establishing a no-disturbance buffer around the plants and demarcation of this buffer by a qualified biologist or botanist using flagging or high-visibility construction fencing. The size of the buffer will be determined by the qualified biologist or botanist and will be large enough to avoid direct or indirect impacts on the plant.

Normal Blooming Period for Special-Status Plants that May Occur within the Plan Area

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bent-flowered fiddleneck			X	X	X	X						
Pallid manzanita	X	X	X									X
Big-scale balsamroot			X	X	X	X						
Big tarplant							X	X	X	X		
Mt. Diablo fairy-lantern				X	X	X						
Bristly sedge					X	X	X	X	X			
Congdon's tarplant					X	X	X	X	X	X		
Franciscan thistle			X	X	X	X	X					
Western leatherwood	X	X	X									
Minute pocket moss[1]	–	–	–	–	–	–	–	–	–	–	–	–
Fragrant fritillary		X	X	X								
Diablo helianthella			X	X	X	X						
Congested-headed hayfield tarplant				X	X	X	X	X	X	X	X	
Northern California black walnut				X	X							
Hall's bush-mallow					X	X	X	X	X			
Oregon meconella			X	X								
Mt. Diablo cottonweed			X	X	X							
San Antonio Hills monardella					X	X	X					
Woodland woollythreads			X	X	X	X	X					
Choris' popcornflower			X	X	X	X						
San Francisco popcornflower			X	X	X	X						
Adobe sanicle		X	X	X	X							
Oval-leaved viburnum					X	X						

1 Non-blooming bryophyte species

Source: Data compiled by Ascent Environmental in 2020; CNPS 2020

- If special-status plant species are found that cannot be avoided during treatments because the treatment objectives cannot be met if the special-status plant is avoided, the following will be implemented:
  - The qualified botanist will determine if the special-status plant population will benefit from treatment in the occupied habitat area even though some of the individual plants may be adversely affected during treatment activities. If the qualified botanist determines that treatment activities will be beneficial to a special-status plant population, no compensatory mitigation will be required. For a treatment to be considered beneficial to special-status plants, the qualified botanist will demonstrate that habitat function (i.e., the arrangement and capability of habitat features to provide refuge, foraging, and reproduction habitat to plants and animals, and thereby contribute to the conservation of biological and genetic diversity and evolutionary processes) is expected to improve with implementation of the treatment such that special-status plant populations would expand, regenerate, or display increased vigor after treatment implementation. This determination will consider and cite scientific studies demonstrating that the species or a similar species has benefitted from increased sunlight from canopy opening, eradication of invasive species, or otherwise reduced competition for resources. This determination will be documented in the survey results letter report. UC Berkeley may consult with CDFW and/or USFWS for technical information regarding this determination.
  - **Plants with California Rare Plant Rank 1, 2, or 3**. If a qualified botanist determines that treatment activities will not be beneficial to a special-status plant population and the species is not listed under ESA, CESA, or NPPA, the qualified botanist will determine if treatment would substantially reduce the abundance, distribution, and viability of local and regional populations as defined by the loss of special-status plants restriction the range of the plant, or substantial modification of habitat function such that the habitat would be rendered unsuitable. The qualified botanist will demonstrate that the abundance, distribution, and viability of local and regional populations of the specific species found would be maintained with implementation of the treatment; this will be documented in the survey results letter report. If the qualified botanist determines that the abundance, distribution, and viability of local and regional populations will not be maintained with implementation of the treatment, UC Berkeley will prepare a Compensatory Mitigation Plan.
  - **Federally or State-Listed Plants**. If a qualified botanist determines that treatment activities will not be beneficial to the plant and the species is listed under ESA, CESA, or NPPA, the qualified botanist will determine if treatment would damage or kill listed plants, or adversely modify their habitat resulting in reduced growth and reproduction or death and loss of listed plant occurrences. This determination will be documented in the survey results letter report. If the qualified botanist determines that treatment will damage or kill listed plants, or adversely modify their habitat resulting in reduced growth and reproduction or death and loss of listed plant occurrences, UC Berkeley will prepare a Compensatory Mitigation Plan.
- If a Compensatory Mitigation Plan is warranted, the following will be implemented:
  - The Compensatory Mitigation Plan will describe the appropriate conservation measures and compensatory mitigation strategy being implemented to compensate for unavoidable losses of special-status plants. The plan will address direct and indirect impacts that could occur as a result of treatment activities and will implement the conservation measures and compensatory mitigation to ensure that treatment will not result in a net loss of the special-status plant. Conservation measures and compensatory mitigation may include preserving and enhancing existing populations, creating off-site populations on mitigation sites through seed collection or transplantation, and/or restoring or creating suitable habitat, and must meet the success criteria described below. If the special-status plant taxa are listed under ESA, CESA, or NPPA, the plan will be submitted to CDFW and/or USFWS (as appropriate) for review and comment.
  - Success criteria for preserved and compensatory populations would include:
    - The extent of occupied area and plant density (number of plants per unit area) in compensatory populations would be equal to or greater than the affected occupied habitat.
    - Compensatory and preserved populations would be self-producing. Populations would be considered self-producing when:

  - o plants reestablish annually for a minimum of five years with no human intervention such as supplemental seeding; and
  - o reestablished and preserved habitats contain an occupied area and flower density comparable to existing occupied habitat areas in similar habitat types in the treatment area vicinity.
- If off-site conservation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures would be included in the plan, including information on responsible parties for long-term management, conservation easement holders, long-term management requirements, success criteria such as those listed above and other details, as appropriate to target the preservation of long term viable populations.
- If relocation efforts are part of the Compensatory Mitigation Plan, the plan would include details on the methods to be used, including collection, storage, propagation, receptor site preparation, installation, long-term protection and management, monitoring and reporting requirements, success criteria such as those listed above, and remedial action responsibilities should the initial effort fail to meet long-term conservation requirements.

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects.

Protocol-level surveys for special-status plants have been conducted throughout the majority of the identified treatment project areas (CCCI 2019a). However, surveys have not yet been completed for the entire treatment area of the Strawberry FHR, the Hearst Gate FB, the East-West FB, landings, TRA 1, and access trails. During these surveys, one special-status plant species, western leatherwood, was observed (CCCI 2019a). These observations were located within TRA 2, Frowning FHR, and additional areas outside of Identified Treatment Project areas (CCCI 2019a).

Relevant EPMs, as described above, would be implemented for all Identified Treatment Projects, which would minimize direct and indirect impacts on special-status plants. Additionally, protocol-level surveys for special-status plants have been conducted throughout several of these treatment areas, have ruled out the presence of all but one special-status plant species (western leatherwood), and have identified the locations of western leatherwood within two Identified Treatment Project areas (CCCI 2019a, Appendix E1). Within Identified Treatment Project areas where the presence of special-status plants has been ruled out through protocol-level surveys, impacts on special-status plant species would not occur, and implementation of EPMs would further reduce the likelihood of impacts on special-status plants adjacent to these treatment areas. However, even with implementation of EPMs, within Identified Treatment Project areas that have not been fully surveyed, within TRA 2 and the Frowning FHR where one special-status plant species was detected, or during treatment maintenance of any Identified Treatment Project, treatment activities could result in direct removal of special-status plants or habitat modifications that lead to reduced growth and reproduction or death and loss of special-status plant occurrences. Because the loss of special-status plants could substantially affect the abundance, distribution, and viability of local and regional populations of these species, this would be a **significant** impact.

Mitigation Measures

Mitigation Measure BIO-1b: Conduct Special-Status Plant Surveys and Implement Avoidance Measures and Mitigation

This measure will be implemented in all portions of Identified Treatment Projects that have not already been surveyed during 2019 protocol-level surveys for special-status plants (CCCI 2019a) and before treatment maintenance in Identified Treatment Project areas.

<u>Significance after Mitigation</u>

WVFMP

Implementation of Mitigation Measures BIO-1a and BIO-1b would reduce potential impacts on special-status plants by requiring reconnaissance-level surveys of later treatment areas to determine the likelihood of presence of special-status plants, protocol-level surveys for special-status plants if determined to be likely to occur, and implementation of protective measures and compensation for impacts on special-status plants. If required, the conservation measures and compensatory mitigation will ensure that treatment will not substantially reduce the abundance, distribution, and viability of local and regional populations of any plant with a California Rare Plant Rank 1, 2, or 3 and will not substantially adversely affect any federally or state-listed plant, either directly or through habitat modifications. With implementation of mitigation, this impact would be **less than significant**.

Identified Treatment Projects

Mitigation Measure BIO-1b would reduce potential impacts on special-status plants by requiring protocol-level surveys for special-status plants within identified treatment project areas that have not already been surveyed, protection of known western leatherwood occurrences, and implementation of protective measures and compensation for impacts on additional special-status plants, if detected. Western leatherwood is a shrub associated with mesic (moderately moist) sites, typically on brushy north or northeast-facing slopes within conifer forest, woodland, and chaparral/scrub communities. Several individual western leatherwood occur on the outer edges of the TRA 2 and Frowning FHR project areas (CCCI 2019a). It may be feasible for UC Berkeley to completely avoid these occurrences and establish a no-disturbance buffer to avoid impacts, pursuant to Mitigation Measure BIO-1b. If not feasible, a qualified biologist may determine that treatment would be beneficial to western leatherwood if the function of the habitat is improved with treatment (e.g., by removing nonnative species or thinning overcrowded stands), potentially increasing available habitat and vigor of individuals.

If western leatherwood occurrences cannot be avoided during treatments, if treatment would not be beneficial to the species, and if impacts to the species would result in a substantial reduction of the abundance, distribution, and viability of local and regional populations, UC Berkeley will prepare a Compensatory Mitigation Plan that describes the appropriate conservation measures and compensatory mitigation strategy being implemented to compensate for unavoidable losses of special-status plants. The conservation measures and compensatory mitigation will ensure that treatment will not substantially reduce the abundance, distribution, and viability of local and regional populations of western leatherwood (or other plants with a California Rare Plant Rank 1, 2, or 3, if detected), either directly or through habitat modifications. Additionally, the conservation measures and compensatory mitigation will ensure that treatment will not substantially adversely affect any federally or state-listed plant, if detected, either directly or through habitat modifications. With implementation of mitigation, this impact would be **less than significant**.

Impact BIO-2: Substantially Affect Special-Status Wildlife Species Either Directly or Through Habitat Modifications

Treatment activities including prescribed broadcast burning, mechanical treatment, manual treatment, managed herbivory, and herbicide treatment, could result in direct or indirect adverse effects on special-status wildlife species. Implementation of EPMs would minimize impacts; however, treatment activities could result in disturbance, injury, or mortality to special-status wildlife species or adverse modifications of habitat. This would be a **significant** impact for the overall WVFMP as well as the Identified Treatment Projects.

Two special-status wildlife species are known to occur within the Plan Area: Alameda whipsnake and San Francisco dusky-footed woodrat (CNDDB 2020, Table 3.5-3). Fourteen additional special-status wildlife species have potential to occur in the Plan Area based on the presence of suitable habitat: California red-legged frog, western pond turtle (*Actinemys marmorata*), American peregrine falcon (*Falco peregrinus*), burrowing owl (*Athene cunicularia*), golden eagle (*Aquila chrysaetos*), northern harrier (*Circus hudsonius*), white-tailed kite (*Elanus leucurus*), yellow warbler (*Setophaga petechia*), monarch butterfly, American badger (*Taxidea taxus*), mountain lion (*Puma concolor*), pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), and western red bat (*Lasiurus blossevillii*) (CNDDB 2020, Table 3.5-3). These special-status wildlife species may occur within various habitat types throughout the Plan Area.

The analysis of impacts to special-status wildlife species first describes the impacts from the elements of the WVFMP that may affect special-status wildlife (i.e., treatment activities, biomass disposition, access roads and landings, and treatment maintenance and monitoring). Then, specific impacts of the overall WVFMP and the Identified Treatment Projects are described for each of the special-status species listed above.

The proposed treatment activities could result in inadvertent disturbance, injury, or mortality of special-status wildlife species through disturbance or destruction of nests, dens, burrows, roosts, or rookeries or through direct trampling, crushing, or burning of individuals. Any of the treatment activities have the potential to disturb, injure, or kill special-status wildlife species, if present within a treatment area, and each of the treatment activities could be used in every treatment type. Treatment activities could also result in habitat modifications, which may reduce habitat function and render the habitat unsuitable for special-status wildlife species.

Indirect beneficial effects in the form of improved native habitat conditions would result from the proposed removal of nonnative eucalyptus, Monterey pine, and French broom. Habitats dominated by these species would be converted to more native-dominated habitats containing coast live oak, California bay, annual grasses, and native scrub. Treatment activities would open up the canopy where tree or shrub densities are uncharacteristic of healthy or desired examples of the native vegetation type and could result in both immediate and long-term benefits to special-status wildlife species through improved habitat conditions. Implementation of the WVFMP would also likely result in a long-term benefit to special-status wildlife because it would reduce the risk of catastrophic wildfires that can kill or injure special-status wildfire. However, given the unpredictability of wildfire, in terms of location and severity, evaluating the specific benefits to biological resources is not feasible and is not considered in determining the significance of this impact under CEQA.

EPM BIO-1 would require all material stockpiling and staging areas to be located within designated landings outside of sensitive habitats, which would reduce the likelihood of disturbance or inadvertent burying or crushing of special-status wildlife. EPM BIO-3 would require any wildlife species encountered during treatment activities to be allowed to leave the treatment area unharmed. EPM BIO-4 would require environmental awareness training for all staff involved with vegetation treatment activities, and this training would include the identification and relevant life history information for special-status wildlife species and habitats that may potentially occur within a treatment area and describe the work practices necessary to effectively implement the EPMs and mitigation measures. EPM BIO-5 would require delineation of treatment areas and restriction of access outside of the treatment area to prevent impacts on sensitive biological resources, including special-status wildlife or habitat. EPM BIO-6 would require the use of existing roads, trails, and former logging paths to minimize ground disturbance from equipment and vehicles, which would further protect special-status wildlife species, ground nests, or burrows, if present within a treatment area. EPM HYD-2 includes provision for use of herbicides in the vicinity of aquatic habitat or riparian areas, including spill prevention, avoidance of herbicide use during precipitation events, and using only herbicides labeled for use in aquatic environments when working in riparian habitats. Finally, EPM HAZ-5 would prohibit spray applications of herbicides when wind speeds are 7 miles per hour or greater and requires the use of low-pressure spray nozzles kept within 24 inches of the target vegetation to reduce the risk of herbicide drift.

Manual Vegetation Treatment

Manual treatment activities would include the use of hand tools (e.g., shovels, Pulaski hoes, McLeod fire tools, machetes, pruning shears, weed whips, weed wrenches, hand saws) and hand-operated power tools (e.g., chainsaws, mechanized brush cutters) to hand pull, thin, prune, and lop vegetation. If manual treatment, including manual removal of trees or tree limbs, occurs during the breeding season, or other sensitive period (e.g., bat maternity season), these activities could result in the direct loss of nests, dens, roosts, or rookeries, within or adjacent to vegetation subject to cutting or other removal methods. This could result in the direct mortality of adults or young, if present. Additionally, special-status wildlife species could be alarmed by the presence of personnel and treatment noise (e.g., use of chainsaws) which could result in nest or den abandonment, and potential mortality of young or loss of eggs. In addition to breeding season impacts, many of the species that could occur within the Plan Area could be present year-round. Thus, potential adverse effects on these and other species as a result of manual treatment activities would not be limited to the breeding season and could disturb foraging and sheltering activities.

Manual treatment activities could result in reduced canopy cover and reduced understory complexity if canopy trees, understory trees, shrubs, snags, and downed woody debris are removed (e.g., cut, uprooted, chopped) or reduction in scrub cover. Overstory thinning may result in increased light penetration and increased growth of herbaceous plant species, which may benefit some wildlife species (McIver et al. 2013). However, because many special-status wildlife species have specific habitat requirements, including some that require high canopy cover and complex understory features, or intact scrub habitat, substantial changes to the character of these features could result in loss of habitat function and exclusion of these species from the treated area.

<u>Mechanical Vegetation Treatment</u>

Mechanical treatment activities would include masticating, cutting, chipping, raking, grading, tilling, mowing, and chopping existing vegetation, using motorized equipment (e.g., feller buncher, yarder, skidder, masticator, tractor, brush cutter, grapple saw). If mechanical treatment occurs during the breeding season, or other sensitive period (e.g., bat maternity season), these activities could result in the direct loss of nest, dens, roosts, or rookeries if present within or adjacent to vegetation subject to cutting or other removal methods. This could result in the direct mortality of adults or young, if present. Additionally, special-status wildlife species could be alarmed by the presence of personnel or heavy equipment (e.g., masticators, trucks) that may cause noise, vibration, and dust, which could result in nest, den, or rookery abandonment, and potential mortality of young or loss of eggs. In addition to breeding season impacts, many of the species that could occur within the Plan Area could be present year-round. Thus, potential adverse effects on these and other species as a result of mechanical treatment activities would not be limited to the breeding season. Heavy equipment could injure or kill special-status wildlife by running over them or by collapsing burrows where wildlife (e.g., Alameda whipsnake) may be hiding or sheltering. Equipment noise could temporarily displace special-status wildlife and potentially disturb foraging or sheltering activities.

Mechanical treatment activities could result in reduced canopy cover and reduced understory complexity if canopy trees, understory trees, shrubs, snags, and downed woody debris are removed (e.g., cut, uprooted, chopped). Because many special-status wildlife species have specific habitat requirements, including some that require high canopy cover and complex understory structure, substantial changes to the character of these understory features could result in loss of habitat function and exclusion of these species from the treated area.

<u>Prescribed Broadcast Burning</u>

Prescribed broadcast burning would include the intentional application of fire as well as installation of fire containment lines around a burn area. If prescribed broadcast burning occurs during a sensitive period in a special-status wildlife species' life history (e.g., breeding season, bat maternity season), active nests, dens, roosts, or rookeries present in the Plan Area could be burned directly, removed or damaged by falling, or otherwise damaged by fire (e.g., heat scorch, smoke damage). This could result in the direct mortality of adults or young, if present. Additionally, special-status wildlife species could be alarmed by the visual, auditory, and olfactory cues of prescribed broadcast burns (e.g., flames, smoke) and by the presence of associated personnel and equipment (e.g., vehicles). This could result in nest, den, roost, or rookery abandonment, and potential mortality of young or loss of eggs. In addition to breeding season impacts, many of the species that could occur within the Plan Area could be present year-round. Thus, potential adverse effects on these and other species as a result of prescribed broadcast burning treatment activities would not be limited to the breeding season and could disturb foraging and sheltering activities.

<u>Managed Herbivory</u>

Managed herbivory would include the use of domestic livestock (e.g., cows, goats, sheep) to reduce a target plant population and/or biomass of a class of vegetation (herbaceous plants and/or shrubs). Managed herbivory would not be likely to result in the direct loss of nests or rookeries within trees, as herbivores primarily remove herbaceous or woody vegetation within the understory. However, livestock used in managed herbivory treatments could crush or otherwise destroy ground nests or dens, or disturb or dislodge nests within shrubs, if present within the treatment area. Some special-status wildlife species may be acclimated to the presence of livestock; however, the presence of herbivores in a confined area would generally be a novel presence for most special-status species. Consequently, if managed herbivory activities occur within the view of a nest, den, or rookery, it is possible that special-status wildlife species could be alarmed by the presence of many cows, goats, or sheep. Additionally, the presence of personnel and equipment (e.g., trucks) associated with installation and removal of fencing and other related infrastructure could also alarm nesting special-status species. The presence of herbivores, personnel, and equipment could potentially result in disruption of breeding behavior and nest, den, or rookery abandonment. Temporary electric fences to control grazing animals would not result in injury or mortality of special-status wildlife from electrocution. Temporary electric fences produce high voltage shocks with very low amperage, which do not cause injury or death in most species under normal circumstances. However, while most wildlife species would be capable of avoiding fencing associated with managed herbivory, it is possible that birds or smaller special-status wildlife species could become entangled in the netting while foraging near the ground or moving through the treatment area.

Herbicide Application

Herbicide treatment would include ground-level application (e.g., paint-on stems or stumps, hand-spray applicator). Herbicide treatment could result in adverse effects on special-status wildlife if an animal consumed vegetation or other prey items that have been exposed to herbicides, consumed contaminated water, or came into direct contact with herbicides, as some herbicides may be toxic to these species. The effect of herbicides on wildlife depends on various factors, including the herbicide used, concentration of the herbicide, weight of the animal, amount of contaminated material consumed and duration of consumption, amount of animal body area exposed, and rate of absorption. Special-status wildlife could be exposed to herbicides through consumption of insects (e.g., insect-eating birds, bats, reptiles) or plant materials (e.g., granivorous birds, San Francisco dusky-footed woodrat) exposed to the chemicals during herbicide application. These species could also be exposed through direct spray or spray drift if animals are present within a treatment area.

Data regarding the effect of herbicides on most special-status species that may occur within the Plan Area are not available, as most studies use laboratory animals (e.g., mice) to determine the effects of chemicals on different classes of animals. As explained in the Herbicide Risk Assessment provided in Appendix G of this EIR, most of the herbicides proposed for use under the WVFMP and Identified Treatment Projects have low toxicity or are considered non-toxic to wildlife. Three of these herbicides, oryzalin, isoxaben, and trifluralin, are moderately or acutely very toxic to fish and aquatic invertebrates. However, EPM HYD-2 would restrict certain applications of herbicides in the vicinity of aquatic habitat or riparian areas, prohibit use before or during precipitation events, and require using only herbicides labeled for use in aquatic environments when working in riparian habitats.

As explained in the Herbicide Risk Assessment provided in Appendix G of this EIR, the herbicides proposed for use are not known to significantly bioaccumulate in animal tissue, so secondary exposure by predatory animals or scavengers (e.g., raptors, mountain lion, American badger, Alameda whipsnake) is not expected to occur. After application, herbicides generally are rapidly absorbed through the leaves and roots of the target plant and may also absorb into surrounding soil. Wildlife exposure to residual herbicides through contact with soil, leaves, or other plant materials is expected to be limited (i.e., chronic exposure would not occur) because of the targeted nature of the herbicide application. Additionally, the herbicides proposed for use would break down over time as a result of UV exposure, air exposure, and other factors and will not persist in the environment. As a result, adverse effects on wildlife from incidental contact with vegetation treated by herbicides would not occur.

Special-status wildlife species could also be alarmed by the presence of vehicles and personnel associated with herbicide treatment, which could result in nest, den, roost, or rookery abandonment, and potential mortality of young or loss of eggs.

Biomass Disposition

Several biomass disposition activities are relevant to biological resources, including burning of treated (e.g., cut, chopped) vegetation onsite in piles, spreading of chipped or masticated vegetation onsite, and leaving cut logs onsite. Pile burning could result in adverse effects on special-status wildlife species if the piles are placed within or near burrows or ground nests. Spreading of chipped vegetation or piling of cut logs could also result in adverse effects on special-status species if the treated vegetation is spread or piled on burrows or ground nests.

Access Roads and Landings

Implementation of treatment activities under the WVFMP would include the use of existing access roads and landings. No new landings or access roads would be constructed under the WVFMP; however, some minor regrading and clearing to reestablish existing landings and an access road would be required. Grading for the access road would occur within 0.3 acre of an existing fire trail in the Plan Area to enable 4WD vehicle passage. Grading or staging of equipment and materials in areas occupied by special-status wildlife could result in direct injury, mortality or disturbance if present. Given the small extent of these areas and their previously disturbed nature, adverse habitat modification would not occur.

Treatment Maintenance and Monitoring

Follow-up maintenance and monitoring of treated areas would be implemented to retain the benefits of initial vegetation treatments. Post-treatment monitoring would be conducted immediately following vegetation treatments and on an annual basis to inform ongoing maintenance strategies. Maintenance treatments could be different than the original treatment used in the area but would not include any new treatment activities not discussed above.

Alameda Whipsnake

Alameda whipsnake is listed as threatened under ESA and CESA. The range of Alameda whipsnake includes Contra Costa County, most of Alameda County, and small portions of northern Santa Clara and western San Joaquin Counties (Stebbins 2003; USFWS 2011). Suitable habitat for Alameda whipsnake includes the mosaic of scrub communities, grassland, and open woodland habitat in the East Bay (Swaim 1994). Although home ranges of Alameda whipsnake are generally centered around scrub and chaparral communities, the home range includes all these habitats (Swaim 1994). Alameda whipsnake have been documented frequently occurring up to a mile from scrub communities and up to four miles from scrub as a maximum distance (Swaim Biological Consulting 2000; Alvarez et al. 2005). Swaim (1994) found most adult Alameda whipsnake had activity centers or core areas (i.e., areas of concentrated use with spatial and/or temporal overlap of multiple individuals). Habitat in core areas primarily consists of scrub communities (e.g., coastal scrub, coyote brush scrub, mixed chaparral, and chamise chaparral) with patch sizes as small as 0.5 acre supporting breeding populations (SBI 2012) Core areas also frequently included adjacent grassland and open woodlands for several individuals (Swaim 1994; USFWS 2006) and is used for breeding, feeding, and sheltering. Foraging and dispersal habitat includes woodland and grassland that is contiguous with scrub habitat (USFWS 2006). Rock outcrops and talus likely enhance habitat for Alameda whipsnake because they provide secure cover and promote abundant lizard prey populations (Swaim 1994). Core areas most commonly occur on northeast, southeast, south, and southwest facing slopes (Swaim 1994). When hillslopes with north and northwest aspects (i.e., compass directions slopes are facing) are present, they are used less frequently by Alameda whipsnake than other aspects; this is likely attributable to the thermal ecology of Alameda whipsnake.

Closed canopy tree stands dominated by nonnative trees such as eucalyptus and Monterey pine are considered degraded or unsuitable habitat (USFWS 2013). Alameda whipsnake are unlikely to use winter retreats in the interior of dense canopy covered tree stands, especially those with northeast or north facing slopes. However, the edges of closed canopy tree stands may contain a transition area with a tree canopy and a scrub or grassland understory and these edge areas are known to be used by Alameda whipsnake. Generally, the species is highly mobile and able to traverse less suitable or unsuitable habitats on a regular basis while moving between patches of suitable habitat in their home range.

Alameda whipsnake are semiarboreal and will climb into the tops of brush and into trees to forage and thermoregulate. Adult Alameda whipsnakes have a bimodal seasonal activity pattern, with a peak during the spring mating season and a smaller peak during the late summer and early fall (Swaim 1994; USFWS 2011). During the winter (generally November through February or March), Alameda whipsnake typically retreat into burrows, rock outcrops, or similar features, although short above-ground movements may still occur (Swaim 1994; USFWS 2000). Alameda whipsnake emerge in late February or March depending on weather conditions (Swaim 1994). Courtship and mating occur from late March through mid-June. During the courtship period, males move extensively, while females appear to remain at or near their winter retreat, where mating occurs. Young appear in late summer and fall, and hatchlings have been observed above ground from August through November (Swaim 1994).

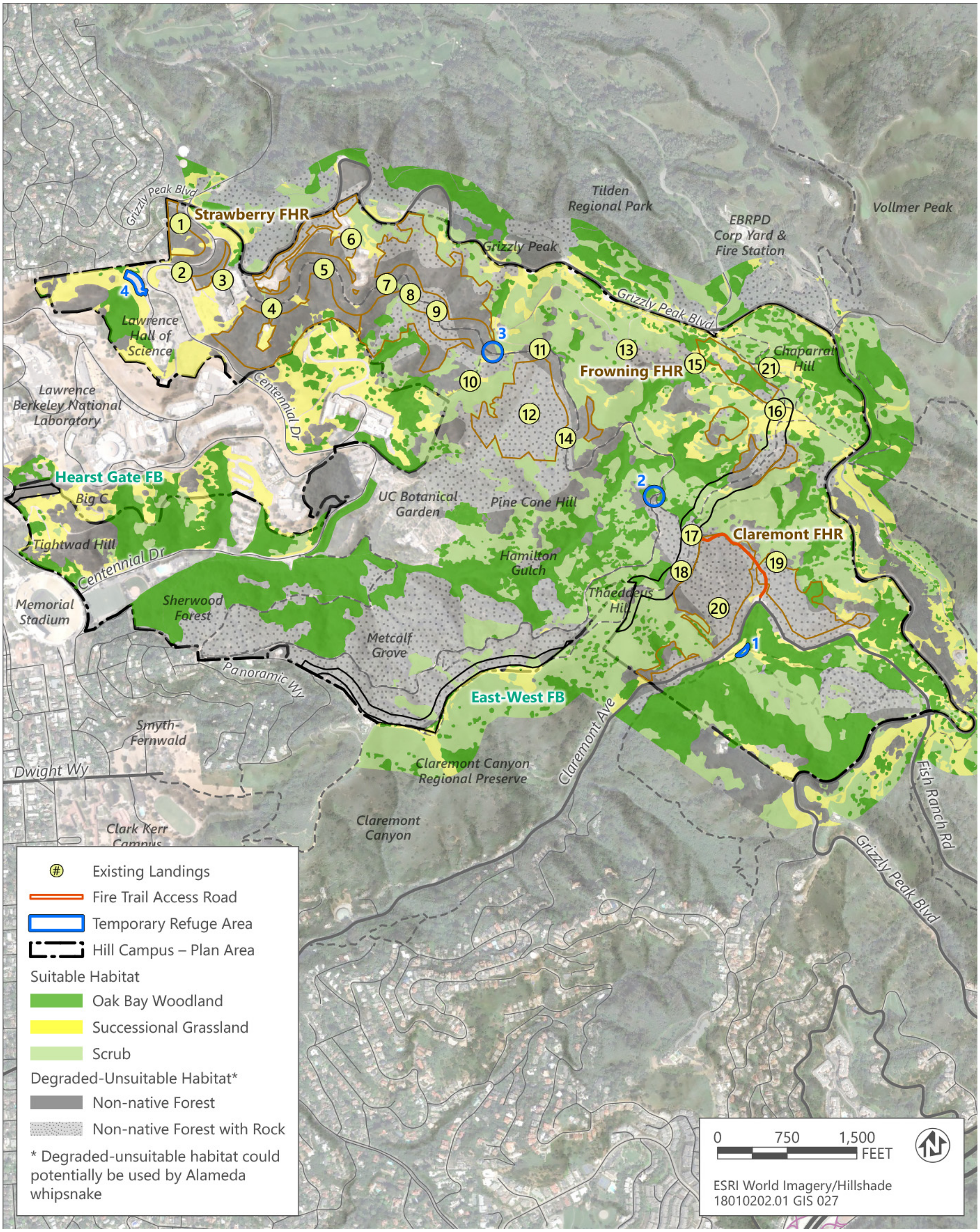
Alameda whipsnakes are known to occur within the Plan Area, have been documented in several different areas, and have potential to occur within several different habitat types (CNDDB 2020). As mapped by SBI after examination of aerial photographs and several reconnaissance-level surveys of the Plan Area in 2019, the Plan Area contains a mosaic of scrub patches embedded within grassland and woodland communities, including nonnative eucalyptus and conifer forests; these scrub patches could potentially be used by Alameda whipsnake (Figure 3.5-3 shows mapped suitable habitat in the Plan Area). Alameda whipsnakes are most frequently found in and near their core type habitat (i.e., scrub and adjacent grassland on slope aspects ranging from northeast to west) but also regularly occur in other habitats (i.e., scrub, grassland, woodland, and grassland or woodland edge on all slope aspects) to move between core type habitat, disperse (especially in fall), and search for mates (especially in spring).

Overall WVFMP (Program-level Analysis)

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on Alameda whipsnake (i.e., EPM BIO-1, BIO-3, BIO-4, BIO-5, BIO-6, HYD-2, and HAZ-5). However, even with implementation of the EPMs, treatments implemented in potentially suitable habitat for Alameda whipsnake (e.g., scrub, grassland, woodland, grassland edge, woodland edge), may result in habitat modification or inadvertent disturbance, injury, or mortality of Alameda whipsnake. Removal or thinning of scrub could result in a loss of habitat function by converting core scrub habitat to foraging/dispersal habitat (e.g., grassland). If present, Alameda whipsnake could be disturbed by the presence of equipment and personnel, resulting in the disruption of essential behavior patterns (e.g., breeding, feeding, or sheltering) to the extent that injury or mortality occurs. In addition, Alameda whipsnake could be inadvertently injured or killed by heavy machinery, personnel, vehicles, livestock, and fire from prescribed broadcast burns and pile burning could result in injury or mortality if the piles are placed on or near burrows.

Indirect beneficial effects in the form of improved native habitat conditions and reduced severity of wildfire would result from the proposed removal of nonnative eucalyptus, Monterey pine, and French broom. Habitats dominated by these species would be converted to more native-dominated habitats such as oak-bay woodland, grassland, and scrub communities, which are more suitable for Alameda whipsnake. In particular, the removal of nonnative species that are encroaching into scrub habitats could promote conversion of these areas to core scrub habitat and improve habitat for Alameda whipsnake. In addition, treatment activities may also result in the enhancement of Alameda whipsnake habitat where smaller, isolated patches of non-core scrub habitat under the existing conditions are joined to larger core scrub patches post-treatment due to the creation of core scrub habitat adjacent to these isolated, smaller shrub patches. Treatment may also enhance Alameda whipsnake habitat where smaller, isolated patches of grassland and oak-bay woodland habitats are joined to larger core scrub, grassland, and oak-bay woodland habitat patches post-treatment from the creation of suitable habitat adjacent to these isolated, smaller patches of grassland and native woodland. Vegetation treatment that reduces the occurrence of catastrophic fires may result in beneficial effects on Alameda whipsnake because large, hot fires can kill individuals and may adversely affect the function of the scrub habitat (USFWS 2002a).

Regardless of the overall long-term benefit implementation of the WVFMP would have for this species, in the short term, active treatments could result in injury or mortality of Alameda whipsnake, disturbance causing substantial disruption of essential behavior patterns (e.g., breeding, feeding, or sheltering) to such an extent that injury or mortality is likely, or substantial degradation of habitat function if treatments occur in native scrub habitat. This impact would be **significant**.



Source: data downloaded from University of California, Berkeley in 2019 and data provided by Swaim Biological Inc in 2020

Figure 3.5-3 Suitable Habitat for Alameda Whipsnake in the Plan Area and Identified Treatment Projects

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure BIO-2a: Conduct Focused Habitat Assessment for Alameda Whipsnake

If it is determined that suitable habitat for Alameda whipsnake is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented during the planning stages for later treatment projects under the WVFMP:

- A qualified biologist will conduct a habitat assessment within a treatment area to determine the likelihood of the species to be present. To be qualified, the biologist will: 1) be knowledgeable in Alameda whipsnake life history and ecology, 2) be able to correctly identify Alameda whipsnake and habitats, 3) have experience conducting field surveys of relevant resources, 4) be knowledgeable about state and federal laws regarding the protection of special-status species, and 5) have experience using CDFW's CNDDB. The habitat assessment will include, but will not be limited to:
  - Identification or verification of the vegetation communities present in the treatment area, using the types presented in Figure 3.5-3 of this EIR;
  - Consideration of known occurrences within the Plan Area;
  - Description of the treatment project, including proposed treatment types and treatment activities;
  - Analysis of the type and likelihood of impacts on Alameda whipsnake as a result of treatment project implementation; and
  - Potential treatment project modifications or additional measures that may avoid and minimize mortality, injury, and disturbance of Alameda whipsnake.
- Results of the habitat assessment will be submitted to UC Berkeley for review and consideration.

Mitigation Measure BIO-2b: Implement Alameda Whipsnake Avoidance and Minimization Measures

Regardless of the results of the reconnaissance-level survey required under Mitigation Measure BIO-1a or habitat assessment required under Mitigation Measure BIO-2a, before implementation of treatment projects under the WVFMP, the following measures will be incorporated into project design:

- A qualified biologist will conduct a pre-treatment survey for Alameda whipsnake within 24 hours of initiation of initial treatment activities or treatment maintenance in treatment area. In addition, a qualified biologist will conduct a daily pre-activity Alameda whipsnake survey sweep for treatments that require more than one day to implement. If an Alameda whipsnake is observed, the qualified biologist will identify actions sufficient to avoid impacts on the species (e.g., halt work) and to allow it to leave the area on its own volition.
- A qualified biologist will monitor all treatment activities. The biologist will monitor the implementation of treatment activities to look for whipsnake and to ensure the measures to avoid impacts on the species are followed. The biologist will monitor truck and equipment access (i.e., the biologist will walk in front of truck or equipment on access roads ordinarily closed to vehicle traffic to look for whipsnake).
- UC Berkeley (or contractors) will immediately (i.e., the same day) process (remove completely from the treatment area, chip, gasify, or permanently place within the treatment area for soil stabilization) all cut materials (i.e., brush, stems, slash, and logs) as they are produced to avoid attracting Alameda whipsnake to the vegetation piles.
- If processing within the same day is not feasible, UC Berkeley (or contractors) will determine suitable location(s) outside of suitable scrub and directly adjacent woodland/grassland habitat (e.g., within landings or temporary refuge areas), in coordination with a qualified biologist, for temporary storage of cut materials that cannot be processed immediately. Log trailers could be used as biomass repositories and removed when full. If vegetation must be removed to create a temporary storage location, UC Berkeley (or contractors) will remove understory vegetation first to facilitate visibility of Alameda whipsnake by a qualified biologist, followed by trees. Then, UC

Berkeley (or contractors) will install temporary fencing to exclude Alameda whipsnake. If temporary exclusion fencing is installed, UC Berkeley (or contractors) will prepare an exclusion fencing plan that identifies the size and location of temporary staging areas, the fencing materials to be used, installation instructions, and monitoring requirements.

- Cut vegetation that will be burned in piles during biomass disposal and utilization will not be placed on top of burrows. Burn piles will be lit from one end (uphill side on slopes) to allow Alameda whipsnakes, that may be using the pile for refuge, to escape. Piles will not be burned during the winter when Alameda whipsnake may be using them as winter retreats (generally November through February or March, as determined by a qualified biologist based on temperature and weather conditions).
- In suitable habitat where suitable winter retreats may be present (e.g., within native scrub habitat not degraded by substantial nonnative tree overstory, rock outcrops within approximately 50 feet of scrub habitat), as determined by a qualified biologist, UC Berkeley (or contractors) will avoid ground disturbance and use of heavy equipment during the winter (generally November through February or March, as determined by a qualified biologist based on temperature and weather conditions).
- Unless removal is required to meet program objectives, UC Berkeley (or contractors) will avoid uprooting any native species within native scrub habitat, as determined by a qualified biologist, and in other habitat, UC Berkeley (or contractors) will retain native species.

Based on the results of the habitat assessment required under Mitigation Measure BIO-2a in this EIR, a qualified biologist will determine if any of the following would occur after implementation of the measures listed above: residual loss of habitat function for Alameda whipsnake; injury or mortality of Alameda whipsnake; or disturbance of Alameda whipsnake that could substantially disrupt essential behavior patterns (e.g., breeding, feeding, or sheltering) to such an extent that injury or mortality is likely. If a qualified biologist determines that these impacts are unlikely, treatment may proceed. If a qualified biologist determines that loss of habitat function for Alameda whipsnake is likely; injury or mortality of Alameda whipsnake is likely; or disturbance of Alameda whipsnake is likely which could substantially disrupt essential behavior patterns (e.g., breeding, feeding, or sheltering) to such an extent that injury or mortality is likely, after implementing the measures identified above, then additional feasible measures will be implemented, as determined in consultation with a qualified biologist. These measures may include the following (and potentially others not listed below):

- UC Berkeley (or contractors) will not conduct treatment activities within 100 feet of scrub habitat in areas where it is likely that Alameda whipsnake could occur, as identified by a qualified biologist.
- UC Berkeley (or contractors) will only operate heavy equipment from developed or disturbed areas (e.g., existing roads).
- UC Berkeley (or contractors) will limit vegetation removal to trees/clumps of trees and nonnative shrubs (e.g., French broom) that can be removed from developed areas (e.g., established roads) or bare areas (i.e., disturbed areas devoid of vegetation and burrows) without ground disturbance outside the road or bare area. The biological monitor will inspect trees and shrubs for whipsnake immediately before removal.
- UC Berkeley (or contractors) will avoid ground disturbance during vegetation removal (i.e., the stump and roots will remain at a height such that ground disturbance is avoided). UC Berkeley (or contractors) will also avoid disturbance of shrub understory and duff, bark, or branches built up at the base of a tree. If disturbance of shrub understory and duff, bark, or branches at the base of the tree is not feasible (i.e., the stump height remains too high to meet fuel-reduction objectives), UC Berkeley (or contractors) may clear duff, bark, or branches built up at the base of the tree by hand only to the extent needed, while allowing for visibility of Alameda whipsnake by the biological monitor, before cutting the tree closer to the base. UC Berkeley (or contractors) will not disturb roots or soil during hand work.
- UC Berkeley (or contractors) will avoid disturbance to suitable rock outcrop habitat by maintaining rock and native shrubs within 50 feet of rock outcroppings.

If a qualified biologist determines that disturbance, injury, or mortality of Alameda whipsnake cannot be avoided through implementation of additional measures, then UC Berkeley would consult with CDFW and USFWS before treatment activities occur and implement any additional measures, including avoidance or compensatory actions, determined through consultation and/or required by incidental take authorization to mitigate impacts on Alameda whipsnake pursuant to CESA and ESA. These additional measures may include installation of exclusion fencing around treatment areas, purchase of credits at a conservation bank, creation of additional habitat, adaptive management strategies, and/or long-term monitoring of treated habitat within the Plan Area to determine whether treatment has improved habitat for Alameda whipsnake. No actions that could adversely affect Alameda whipsnake will be allowed if disturbance, injury, or mortality of Alameda whipsnake could result, unless consultation with CDFW and USFWS is completed and additional measures are implemented as required through consultation.

Mitigation Measure BIO-5a: Install Wildlife-Friendly Fencing for Managed Herbivory Treatments

If temporary fencing is required for managed herbivory treatment, a wildlife-friendly fencing design will be used. UC Berkeley will require a qualified biologist to review and approve the design before installation to minimize the risk of wildlife entanglement. The fencing design will meet the following standards:

- Minimize the chance of wildlife entanglement by avoiding barbed wire, loose or broken wires, or any material that could impale or snag a leaping animal; and, if feasible, keeping electric netting-type fencing electrified at all times or laid down while not in use.
- Charge temporary electric fencing with intermittent pulse energizers. Continuous output fence chargers will not be permitted.
- Allow wildlife to jump over easily without injury by installing fencing that can flex as animals pass over it and installing the top wire low enough (no more than approximately 40 inches high on flat ground) to allow adult deer to jump over it. The determination of appropriate fence height will consider slope, as steep slopes are more difficult for wildlife to pass.
- Be highly visible to birds and mammals by using high-visibility tape or wire, flagging, or other markers.

<u>Identified Treatment Projects (Project-level Analysis)</u>

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. These EPMs would minimize direct and indirect impacts on Alameda whipsnake.

All of the identified treatment projects contain potentially suitable habitat for Alameda whipsnake (e.g., scrub, grassland, woodland, grassland edge, woodland edge; Figure 3.5-3). Treatment activities would occur within approximately 10.5 acres of scrub habitat, 3.8 acres of successional grassland habitat, and 7.02 acres of oak-bay woodland habitat (Table 3.5-4), which are the habitats most suitable for Alameda whipsnake, although whipsnakes are known to move through all habitat types in the Identified Treatment Project areas. If Alameda whipsnake are hibernating, breeding, foraging, or moving through Identified Treatment Project areas, implementation of treatment activities could result in disturbance, injury, or mortality of this species, even with implementation of the EPMs. If present, Alameda whipsnake could be disturbed from the presence of equipment and personnel and could be inadvertently injured or killed by heavy machinery, personnel, vehicles, and fire. This impact would be **significant**.

Mitigation Measure BIO-2b: Implement Alameda Whipsnake Avoidance and Minimization Measures

Significance after Mitigation

WVFMP

Mitigation Measures BIO-1a, BIO-2a, BIO-2b, and BIO-5a would reduce potential impacts on Alameda whipsnake by requiring habitat assessments to confirm the likelihood of the species to be present within a treatment project and which specific impacts could occur from treatment, implementation of impact avoidance and minimization measures to reduce the likelihood of disturbance, injury, or mortality, and maintain habitat function, and potentially additional mitigation required by CDFW and/or USFWS through incidental take authorization if warranted. The impact avoidance and minimization measures in Mitigation Measure BIO-2b would reduce impacts by requiring measures such as maintenance of core scrub habitat where feasible, biological monitoring by a qualified biologist, and in certain areas, may require equipment that would have the potential to injure or kill Alameda whipsnakes by running over them or by collapsing burrows where the Alameda whipsnake may be hiding or hibernating to remain on established roads where soils are compressed and burrows and vegetation do not occur. Mitigation Measure BIO-5a would reduce impacts by requiring use of wildlife friendly fencing to avoid entanglement. With implementation of these mitigation measures, impacts would be **less than significant** because habitat function would be maintained and injury, mortality, or substantial disruption of essential behavior patterns (e.g., breeding, feeding, or sheltering) would be avoided or minimized.

Identified Treatment Projects

Mitigation Measure BIO-2b would reduce potential impacts on Alameda whipsnake by requiring implementation of avoidance and minimization measures to reduce the likelihood of impacts and maintain habitat function. Based on the habitat assessment conducted by SBI in 2019 for the Identified Treatment Projects, project-specific avoidance and minimization measures from Mitigation Measure BIO-2b are warranted, including maintenance of core scrub habitat where feasible, biological monitoring by a qualified biologist, and in certain areas, require equipment that would have the potential to injure or kill Alameda whipsnakes by running over them or collapsing potentially occupied burrows to remain on the established roads where soils are compressed and burrows and vegetation do not occur. In areas where a qualified biologist determines that disturbance, injury, or mortality of Alameda whipsnake cannot be avoided with the avoidance and minimization measures from Mitigation Measures BIO-2b, UC Berkeley would consult with CDFW and USFWS and obtain incidental take authorization if necessary before implementing treatment activities in those areas. Additional measures, potentially including compensatory mitigation, may be required by CDFW and/or USFWS through incidental take authorization, if warranted, pursuant to Mitigation Measure BIO-2b. With implementation of these mitigation measures, this impact would be **less than significant** because habitat function would be maintained, and injury, mortality, or substantial disruption of essential behavior patterns (e.g., breeding, feeding, or sheltering) would be avoided or minimized.

California Red-Legged Frog

California red-legged frog is listed as threatened under ESA and is a CDFW species of special concern. California red-legged frog occur along the Coast Ranges from Mendocino County south, and in portions of the Sierra Nevada and Cascade Ranges (CDFW 2008). This species is most abundant within the inner Coast Ranges from Point Reyes, Marin County to southern Santa Barbara County, and within eastern Contra Costa and Alameda Counties (Thomson et al. 2016). Suitable habitat for California red-legged frog is typically characterized by aquatic breeding area (e.g., pools within streams and creeks, ponds, marshes, stock ponds) within a matrix of riparian and upland dispersal habitat (USFWS 2002b). Adult frogs are nearly always associated with permanent bodies of water (Amphibiaweb 2020). During rainy weather, California red-legged frogs may move overland through upland habitat; however, in general, the species is rarely observed far from water (USFWS 2002b).

There are no known occurrences of California red-legged frog within the Plan Area (CNDDB 2020, CCCI 2019b). There are several known occurrences of California red-legged frog within the East Bay hills, including occurrences with documented breeding (CNDDB 2020). The nearest known occurrences of California red-legged frog to the Plan Area have been documented by the East Bay Regional Park District (EBRPD) (CCCI 2019b). One of these occurrences is located in the vicinity of Lake Anza, which is approximately 1 mile north of the Plan Area (CCCI 2019b). There is one additional historic occurrence within the Tilden Regional Park Botanic Garden Pond approximately 0.7 mile north of the Plan Area; however, this occurrence is presumed to be extirpated (CCCI 2019b). The nearest known extant occurrence (near Lake Anza) is separated from the Plan Area by approximately 1 mile and is within the Wildcat Creek watershed, which is not connected to the watersheds associated with the Plan Area. While overland movements of this magnitude have been documented, a dispersing frog would have to traverse the large Tilden Park Golf Course north of the Plan Area and across a well-traveled road (Grizzly Peak Boulevard), and this movement would only be possible during wet months. Dispersal of California red-legged frogs from this known occurrence into the Plan Area is extremely unlikely.

In 2019, a California red-legged frog habitat assessment was conducted, which included analysis of the suitability of aquatic and upland habitat within the Plan Area for the species (CCCI 2019b, Appendix E2). The habitat assessment determined that most of the aquatic habitat (e.g., Strawberry Creek, Claremont Creek) within the Plan Area does not provide suitable aquatic habitat for California red-legged frog because these features lack sufficient pools or emergent vegetation (CCCI 2019b). One aquatic feature in the Plan Area, the UC Berkeley Botanical Garden Japanese Pool pond (hereafter, pond), was determined to contain potentially suitable aquatic breeding habitat for California reg-legged frog (CCCI 2019b). The artificial, perennial pond is approximately 3 feet deep, fed by Strawberry Creek, and contains emergent vegetation (CCCI 2019b). Rough-skinned newts (*Taricha granulosa*), California newts (*Taricha torosa*), and Sierran tree frogs (*Psuedacris sierra*) were observed in the pond, suggesting that it is habitable for native amphibians (CCCI 2019b). California red-legged frogs were not detected in this pond during three surveys of the pond in 2019 (CCCI 2019b). Additionally, there are no known records of California red-legged frogs in the pond, either in the CNDDB or documented by UC Berkeley Botanical Garden staff (Licht, pers. comm., 2020).

Because California red-legged frogs have not been historically documented at the pond and frogs were not detected during recent surveys of the pond, it is not likely that the species is present in this pond. However, the three surveys were conducted toward the end of the breeding season, and USFWS typically recommends up to eight surveys, timed throughout the breeding and nonbreeding season, to determine the presence of California red-legged frog (USFWS 2005). The pond may provide suitable habitat for this species and without further surveys, the presence of California red-legged frog within the pond cannot be ruled out.

Adult and juvenile California red-legged frog are known to travel through upland habitat (e.g., riparian, woodland, grassland) to move between breeding and nonbreeding sites (e.g., other ponds, deep pools in streams, moist and cool riparian understory, burrows) for access to refugia and foraging habitat, or to disperse to new breeding locations. Studies have demonstrated that California red-legged frogs remain very close to breeding ponds during the nonbreeding season and typically do not move more than approximately 500 feet into upland habitats (Bulger et al. 2003; Fellers and Kleeman 2007). The identified potentially suitable breeding pond is perennial and could likely provide suitable habitat for California red-legged frog year-round. There was no additional suitable breeding habitat (e.g., with deep ponds, emergent vegetation) identified within the Plan Area. Therefore, it is extremely unlikely California red-legged frog occur in the Plan Area because there are no known occurrences within one mile of the Plan Area and because there is no evidence this potential breeding pond is occupied despite surveys and monitoring of the pond. In the unlikely event that California red-legged frog do occupy the pond, it is extremely unlikely frogs would move farther than 500 feet from the pond because there is no other potentially suitable breeding habitat to disperse to in the Plan Area.

<u>Overall WVFMP (Program-level Analysis)</u>

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on California red-legged frog (i.e., EPM BIO-1, BIO-3, BIO-4, BIO-5, BIO-6, HYD-2, and HAZ-5). As explained in the analysis above, the only potentially suitable aquatic breeding habitat for California red-legged frogs within the Plan Area is the pond. If frogs are present within the pond, they would likely be found in close proximity to the pond (i.e., within 500 feet). It is unlikely that a California red-legged frog inhabiting the pond would disperse long distances from the pond; however, it is possible that they could be found in upland areas up to approximately 500 feet from the pond. The area within approximately 500 feet of the pond includes the

UC Berkeley Botanical Garden, buildings, roads, and trails associated with the Botanical Garden, and a canyon east of the pond characterized by coniferous forest habitat through which Strawberry Creek runs.

To avoid and minimize adverse potential acute or chronic effects on California red-legged frog in aquatic habitat from herbicide application, EPM HYD-2 requires that herbicides not approved for aquatic use would not be used, stored, or mixed within 60 feet of any surface waters or wetlands. In addition, EPM HYD-2 specifies that herbicides cannot be applied when rain may rinse them off of plants and into soil or water. Furthermore, glyphosate and Garlon cannot be used without prior approval by the UC's Integrated Pest Management Committee (Section 2.5.2, "Description of Vegetation Treatment Activities"). If use is permitted by the committee, regulations for the approved uses of glyphosate and Garlon on the UC Berkeley campus would be more stringent than what is currently required by state law. Herbicide restrictions associated with the California red-legged frog injunction (Center for Biological Diversity v. U.S. Environmental Protection Agency (2006) Case No.: 02-1580-JSW) do not apply because the Plan Area does not contain California red-legged frog critical habitat or non-critical habitat sections named in the injunction. However, implementation of EPM HYD-2 would minimize the likelihood of adverse effects on California red-legged frog from herbicide application.

If later treatment projects implemented under the WVFMP would occur within the UC Berkeley Botanical Garden, or other undeveloped areas within 500 feet of the pond, treatment activities may result in inadvertent disturbance, injury, or mortality of California red-legged frogs, if present within the pond and the upland area surrounding the pond, even with implementation of the EPMs. If present, California red-legged frogs could be disturbed by the presence of equipment and personnel, resulting in the disruption of essential behavior patterns (e.g., breeding, feeding, or sheltering) to the extent that injury or mortality occurs. In addition, California red-legged frog could be inadvertently injured or killed by heavy machinery, personnel, vehicles, livestock, and fire from prescribed broadcast burning and pile burning.

This impact would be **significant**.

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure HYD-1: Establish Watercourse Protection Buffers

Mitigation Measure BIO-2c: Conduct Protocol-Level Surveys for California Red-Legged Frog and Implement Additional Avoidance and Minimization Measures

If it is determined that a treatment area is within 500 feet of the UC Berkeley Botanical Garden pond (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented during the planning stages for later treatment projects under the WVFMP:

- Protocol-level surveys for California red-legged frog will be conducted within the pond in accordance with the USFWS "*Revised Guidance on Site Assessments and Field Surveys for the California Red-Legged Frog*" (USFWS 2005). Up to eight surveys will be conducted between January and September, including two day surveys and four night surveys during the breeding season (approximately late November to April) and one day and one night survey during the non-breeding season (July 1–September 30). The survey period will extend over a period of at least six weeks.
- If no California red-legged frogs are detected, copies of data sheets, field notes, and all other supporting documentation will be provided to the appropriate USFWS Office for review. If the results of the protocol-level surveys are accepted by USFWS, further mitigation is not required.
- If California red-legged frogs are detected within the pond, no additional surveys will be conducted, and UC Berkeley will notify USFWS in writing within three working days of the detection.
- If California red-legged frogs are detected within the pond, then treatments within 500 feet of the pond may result in disturbance, injury, or mortality of the species. A qualified biologist will determine if any of the following are likely

after implementation of the EPMs and Mitigation Measure HYD-1: residual loss of habitat function for California red-legged frog; injury or mortality of California red-legged frog; or disturbance of California red-legged frog which could substantially disrupt essential behavior patterns (e.g., breeding, feeding, or sheltering) to such an extent that injury or mortality is likely.

- If a qualified biologist determines that habitat function for California red-legged frog is likely to be maintained; injury or mortality of California red-legged frog is unlikely; and disturbance of California red-legged frog is not anticipated which could substantially disrupt essential behavior patterns (e.g., breeding, feeding, or sheltering) to such an extent that injury or mortality is likely, with implementation of the EPMs and Mitigation Measure HYD-1, treatment project implementation may proceed.
- If a qualified biologist determines that residual loss of habitat function for California red-legged frog is likely; injury or mortality of California red-legged frog is likely; or disturbance of California red-legged frog is likely which could substantially disrupt essential behavior patterns (e.g., breeding, feeding, or sheltering) to such an extent that injury or mortality is likely, UC Berkeley will consult with USFWS and implement any additional measures determined through consultation and/or required by incidental take authorization. Measures may include but are not limited to seasonal restrictions, exclusion fencing, relocation of frogs, and compensatory mitigation.

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. These EPMs would minimize direct and indirect impacts on California red-legged frog.

As explained in the analysis above, it is unlikely that a California red-legged frog inhabiting the pond would move more than approximately 500 feet from the pond, especially since there is no other suitable aquatic breeding habitat to disperse to within the Plan Area. The only Identified Treatment Projects in the vicinity of the pond, which represents the only potentially suitable aquatic breeding habitat for California red-legged frog in the Plan Area, is a portion of the Frowning FHR project. The Frowning FHR project is located approximately 805 feet northwest of the pond. All other Identified Treatment Projects are farther than 500 feet away from the pond. As a result, implementation of the Identified Treatment Projects would not result in adverse effects on California red-legged frog. Impacts on this species would be **less than significant**, and no mitigation is required.

Mitigation Measures

No mitigation is required for this impact.

Significance after Mitigation

WVFMP

Mitigation Measures BIO-1a, HYD-1, and BIO-2c would reduce potential impacts on California red-legged frogs by establishing watercourse protection buffers around aquatic habitat, and requiring reconnaissance-level and protocol-level surveys to confirm presence or absence of the species within the pond and additional avoidance and minimization measures to fully mitigate impacts if frogs are confirmed to be present. With implementation of these mitigation measures, impacts would be reduced to **less than significant** because habitat function would be maintained and injury, mortality, or substantial disruption of essential behavior patterns (e.g., breeding, feeding, or sheltering) would be avoided or minimized.

Identified Treatment Projects

No mitigation is required for this impact.

Western Pond Turtle

Western pond turtle is a CDFW species of special concern. This species can be found in many different aquatic habitats, including ponds (natural or human-made), marshes, rivers, and irrigation ditches. Western pond turtle uses upland habitat for basking and egg-laying. Upland habitat may include grasslands, scrub, or woodland habitats. Western pond turtles are known to travel into uplands up to 0.3 mile from aquatic habitat (Reese and Welsh 1997). There is one known occurrence approximately 1.4 mile south and one approximately 0.8 mile north of the Plan Area (CNDDB 2020). The aquatic resources within the Plan Area (e.g., Strawberry Creek, Claremont Creek, ponds associated with the UC Berkeley Botanical Garden) provide potential habitat for this species.

<u>Overall WVFMP (Program-level Analysis)</u>

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on western pond turtle (i.e., EPM BIO-1, BIO-3, BIO-4, BIO-5, BIO-6, HYD-2, and HAZ-5). Even with implementation of EPMs, treatment activities within potentially suitable habitat for western pond turtle (e.g., streams, drainages, associated grassland, scrub, or woodland upland habitat) may result in inadvertent disturbance, injury, or mortality of western pond turtle. If present, western pond turtle could be disturbed by the presence of equipment and personnel and could be inadvertently injured or killed by heavy machinery, personnel, vehicles, and fire from prescribed broadcast burns. Additionally, pile burning could result in adverse effects on western pond turtle if the piles are placed on or near burrows. This impact would be **significant**.

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure HYD-1: Establish Watercourse Protection Buffers

Mitigation Measure BIO-2d: Conduct Surveys for Western Pond Turtle, Implement Avoidance Measures, and Relocate Individuals

If it is determined that suitable aquatic or upland habitat for western pond turtle is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented within 24 hours before implementation of treatment activities:

- A qualified biologist familiar with the life history of western pond turtle and experience performing surveys for western pond turtle will conduct a focused survey of suitable habitat within the treatment area. If potentially suitable aquatic habitat is present within a treatment area (e.g., creeks, streams, ponds, drainages), upland habitat within approximately 1,500 feet of this aquatic habitat will also be surveyed. The qualified biologist will inspect the treatment area for western pond turtles as well as suitable burrow habitat.
- If western pond turtles are not detected during the focused survey, then further mitigation is not required.
- If western pond turtles are detected, a no-disturbance buffer of at least 100 feet will be established around any identified nest sites or overwintering sites. A qualified biologist with an appropriate CDFW Scientific Collecting Permit that allows handling of reptiles will be present during treatment activities and will inspect the treatment area before initiation of treatment activities. If western pond turtles are detected, the qualified biologist will move the turtles downstream and out of harm’s way.

<u>Identified Treatment Projects (Project-level Analysis)</u>

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. These EPMs would minimize direct and indirect impacts on western pond turtle.

All of the Identified Treatment Projects are within approximately 1,500 feet of potentially suitable aquatic habitat for western pond turtle (e.g., Strawberry Creek, Claremont Creek, drainages), so all of these projects may potentially contain suitable upland habitat for the species. As a result, treatment activities within these treatment areas may result in inadvertent harassment, injury, or mortality of western pond turtle even with implementation of the EPMs. If present, western pond turtle could be harassed by the presence of equipment and personnel and could be inadvertently injured or killed by heavy machinery, personnel, or vehicles. This impact would be **significant**.

Mitigation Measures

Mitigation Measure BIO-2d: Conduct Surveys for Western Pond Turtle, Implement Avoidance Measures, and Relocate Individuals

Mitigation Measure HYD-1: Establish Watercourse Protection Buffers

Significance after Mitigation

WVFMP and Identified Treatment Projects

Mitigation Measures BIO-1a (for WVFMP only), HYD-1, and BIO-2d would reduce potential impacts on western pond turtle by establishing watercourse protection buffers around aquatic habitat, requiring reconnaissance-level surveys for biological resources to confirm the likelihood of the species to be present within a treatment area, focused pre-activity surveys within treatment areas where presence is likely, and implementation of no-disturbance buffers and relocation of turtles if nest sites or individuals are detected, respectively. With implementation of these mitigation measures, disturbance, injury, or mortality would be avoided or minimized and treatment activities would not substantially affect the abundance, distribution, and viability of the population. Impacts would be reduced to **less than significant**.

Burrowing Owl

Burrowing owl is a CDFW species of special concern. This species is not known to occur within the Plan Area; however, burrowing owls have been observed northwest of the Plan Area in the City of Richmond and west of the Plan Area near Cesar Chavez Park in the City of Berkeley and other areas along San Francisco Bay (CNDDB 2020, eBird 2020). Suitable habitat for burrowing owls is composed of grassland, including ruderal grassland and vacant lots, as well as shrubland where shrubs are sparse. Burrowing owls require habitat with sufficient burrows created by fossorial mammals, most commonly California ground squirrel (*Otospermophilus beecheyi*). The Plan Area contains grassland and scrub habitat, which may be suitable for this species.

Overall WVFMP (Program-level Analysis)

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on burrowing owl (i.e., EPM BIO-1, BIO-3, BIO-4, BIO-5, BIO-6, HYD-2, and HAZ-5). However, treatment activities within potentially suitable habitat for burrowing owl (e.g., grassland, scrub with sparse shrub cover) may result in inadvertent disturbance injury, or mortality of the species even with implementation of EPMs. If present, burrowing owls could be disturbed by the presence of equipment and personnel and could be inadvertently injured or killed by heavy machinery, personnel, vehicles, and fire from prescribed broadcast burning. Active burrows could be inadvertently crushed and destroyed, if present, potentially resulting in the loss of eggs or chicks. Additionally, pile burning could result in adverse effects on burrowing owls if the piles are placed on or near burrows. This impact would be **significant**.

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure BIO-2e: Conduct Protocol-level Surveys for Burrowing Owl, Implement Avoidance Measures, and Compensate for Loss of Occupied Burrows

If it is determined that suitable habitat for burrowing owl is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented during the planning stages of a treatment project under the WVFMP:

- A qualified biologist with familiarity of burrowing owl life history and survey protocols will conduct a burrowing owl habitat assessment in accordance with Appendix C of the *CDFW Staff Report on Burrowing Owl Mitigation* (CDFW 2012, or most current version) (CDFW Staff Report).
- If the treatment area does not contain suitable burrowing owl habitat (e.g., ruderal grassland, successional grassland, scrub habitat with sparse shrub cover, mammal burrows or burrow surrogates, friable soil), as determined by the qualified biologist, then further mitigation for burrowing owl is not required.
- If the qualified biologist determines that suitable burrowing owl habitat is present within the treatment area, then the qualified biologist will conduct focused breeding and nonbreeding season surveys for burrowing owls in areas of suitable habitat identified during the habitat assessment or reconnaissance-level survey (e.g., ruderal grassland, successional grassland, scrub habitat with sparse shrub cover) on and within 1,500 feet of the treatment area. Surveys will be conducted before the start of treatment activities and in accordance with Appendix D of the CDFW Staff Report.
- If no occupied burrows are found, the qualified biologist will submit a letter report documenting the survey methods and results to UC Berkeley and no further mitigation will be required.
- If an active burrow is found within 1,500 feet of a treatment area and treatment activities would occur during the nonbreeding season (September 1 through January 31), UC Berkeley will consult with CDFW during treatments. If occupied burrows are present that cannot be avoided or adequately protected with a no-disturbance buffer, a burrowing owl exclusion plan will be developed, as described in Appendix E of the CDFW Staff Report. Burrowing owls will not be excluded from occupied burrows until the project's burrowing owl exclusion plan is approved by CDFW. The exclusion plan will include a plan for creation, maintenance, and monitoring of artificial burrows in suitable habitat.
- If an active burrow is found during the breeding season (February 1 through August 31), occupied burrows will not be disturbed and will be provided with a protective buffer unless a qualified biologist verifies through noninvasive means that either: (1) the birds have not begun egg laying, or (2) juveniles from the occupied burrows are foraging independently and are capable of independent survival. The size of the buffer will depend on the time of year and level of disturbance as outlined in the CDFW Staff Report. The size of the buffer may be reduced if a broad-scale, long-term, monitoring program acceptable to CDFW is implemented so that burrowing owls are not adversely affected. Once the fledglings are capable of independent survival, the owls can be evicted and the burrow can be destroyed per the terms of a CDFW-approved burrowing owl exclusion plan developed in accordance with Appendix E of CDFW Staff Report.
- If active burrowing owl nests are found within a treatment area and are destroyed by implementation of treatment activities, UC Berkeley will mitigate the loss of occupied habitat in accordance with guidance provided in the CDFW Staff Report, which states that permanent impacts on nesting, occupied and satellite burrows, and burrowing owl habitat will be mitigated such that habitat acreage and number of burrows are replaced through permanent conservation of comparable or better habitat with similar vegetation communities and burrowing mammals (e.g., ground squirrels) present to provide for nesting, foraging, wintering, and dispersal. UC Berkeley will retain a qualified biologist to develop a burrowing owl mitigation and management plan that incorporates the following goals and standards:

- Mitigation lands will be selected based on comparison of the habitat lost to the compensatory habitat, including type and structure of habitat, disturbance levels, potential for conflicts with humans, pets, and other wildlife, density of burrowing owls, and relative importance of the habitat to the species range wide.
- If feasible, mitigation lands will be provided adjacent or proximate to the project site so that displaced owls can relocate with reduced risk of injury or mortality. Feasibility of providing mitigation adjacent or proximate to the project site depends on availability of sufficient suitable habitat to support displaced owls that may be preserved in perpetuity.
- If suitable habitat is not available for conservation adjacent or proximate to the project site, mitigation lands will be focused on consolidating and enlarging conservation areas outside of urban and planned growth areas and within foraging distance of other conservation lands. Mitigation may be accomplished through purchase of mitigation credits at a CDFW-approved mitigation bank, if available. If mitigation credits are not available from an approved bank and mitigation lands are not available adjacent to other conservation lands, alternative mitigation sites and acreage will be determined in consultation with CDFW.
- If mitigation is not available through an approved mitigation bank and will be completed through permittee-responsible conservation lands, the mitigation plan will include mitigation objectives, site selection factors, site management roles and responsibilities, vegetation management goals, financial assurances and funding mechanisms, performance standards and success criteria, monitoring and reporting protocols, and adaptive management measures. Success will be based on the number of adult burrowing owls and pairs using the site and if the numbers are maintained over time. Measures of success, as suggested in the CDFW Staff Report, will include site tenacity, number of adult owls present and reproducing, colonization by burrowing owls from elsewhere, changes in distribution, and trends in stressors.

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. These EPMs would minimize direct and indirect impacts on burrowing owl.

Implementation of the Identified Treatment Projects would result in treatment activities within approximately 3.8 acres of successional grassland habitat; primarily within the East-West FB and the Strawberry Canyon FHR project area (Table 3.5-4). Additionally, treatment activities would occur within approximately 10.5 acres of scrub habitat, which may provide suitable habitat for burrowing owl where shrub cover is sparse (Table 3.5-4). If active burrowing owl burrows are present within this habitat, implementation of treatment activities could result in adverse effects on this species even with implementation of the EPMs. Ground disturbance associated with mechanical treatment activities could result in inadvertent crushing of burrows or individual burrowing owls, and the presence of vehicles, equipment, and personnel associated with other treatment activities could result in injury or mortality of individual burrowing owls or disturbance potentially leading to abandonment of an active burrow, which could result in loss of eggs or chicks. This would be a **significant** impact.

Mitigation Measures

Mitigation Measure BIO-2e: Conduct Protocol-level Surveys for Burrowing Owl, Implement Avoidance Measures, and Compensate for Loss of Occupied Burrows

Significance after Mitigation

WVFMP and Identified Treatment Projects

Mitigation Measures BIO-1a (for WVFMP only) and BIO-2e would reduce potential impacts on burrowing owl by requiring reconnaissance-level surveys for biological resources to confirm the likelihood of the species to be present within a treatment project area, protocol-level surveys within treatment areas where presence is likely, implementation of no-disturbance buffers around occupied burrows, or compensatory mitigation if burrows cannot be avoided. With implementation of EPMs and these mitigation measures, disturbance, injury, or mortality would be avoided or minimized and treatment activities would not substantially affect the abundance, distribution, and viability of the population. This impact, for both the overall WVFMP and Identified Treatment Projects, would be reduced to **less than significant**.

American Peregrine Falcon, Golden Eagle, White-Tailed Kite, Northern Harrier, Other Nesting Raptors, Yellow Warbler, and Other Native Nesting Birds

American Peregrine Falcon, Golden Eagle, and white-tailed kite are fully protected under California Fish and Game Code, and northern harrier and yellow warbler are CDFW species of special concern. Golden eagles are also protected under the Bald and Golden Eagle Protection Act. Additionally, other raptor species (e.g., Cooper's hawk, red-tailed hawk, red-shouldered hawk) and other native nesting birds could nest within the Plan Area, and these species and their nests are protected by California Fish and Game Code. Suitable nesting habitat for white-tailed kite and other nesting raptors includes large trees within the Plan Area (e.g., eucalyptus, coast live oak, Monterey pine), especially those associated with riparian areas along Strawberry Creek and Claremont Creek. Suitable nesting habitat for northern harrier includes grasslands and shrubby areas within scrub habitat, especially near riparian areas. Yellow warblers nest within riparian woodland habitat, which has been documented but not quantified within the Plan Area. Other native nesting birds with potential to occur in the Plan Area include those that nest on the ground, within shrubs, or within trees of various sizes. While American peregrine falcons may forage within the Plan Area, there is no suitable nesting habitat (e.g., ledge, cliff, human-made structure). Implementation of the WVFMP and Identified Treatment Projects would not result in loss of foraging habitat or a significant negative change in the character of the foraging habitat within the Plan Area; treatment activities may improve habitat in the Plan Area for foraging peregrine falcons by reducing dense vegetation cover. Because treatment activities would not result in direct loss of American peregrine falcon or nests, this species is not discussed further. All of the other species listed above have potential to nest within the relatively undeveloped portions of the Plan Area; however, most of these species may also nest near developed areas associated with UC Berkeley and Lawrence Berkeley National Laboratory.

Overall WVFMP (Program-level Analysis)

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on nesting birds (i.e., EPM BIO-1, BIO-3, BIO-4, BIO-5, BIO-6, HYD-2, and HAZ-5). However, treatment activities within potentially suitable habitat for nesting raptors and other nesting birds (e.g., grassland, scrub, woodland, forest) may result in inadvertent disturbance, injury, or mortality of the species even with implementation of the EPMs. Vegetation removal associated with treatment activities, including removal of trees, shrubs, or grasses, could result in direct injury or mortality of nesting birds, chicks, or eggs, if present. If present, nesting raptors and other birds could be disturbed by the presence of equipment and personnel, potentially resulting in abandonment of the nest. Nesting birds could be inadvertently injured or killed by heavy machinery, personnel, vehicles, livestock, and fire from prescribed broadcast burns and pile burning. This impact would be **significant**.

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure BIO-2f: Conduct Focused Surveys for Nesting Raptors and Other Native Nesting Birds and Implement Protective Buffers

If it is determined that suitable habitat for nesting raptors or other native nesting birds, including special-status species (i.e., white-tailed kite, northern harrier, yellow warbler) is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented:

- To minimize the potential for loss of nesting raptors and other birds, treatment activities will be conducted during the nonbreeding season (approximately September 1-January 31, as determined by a qualified biologist), if feasible. If treatment activities are conducted during the nonbreeding season, no further mitigation will be required.
- Within 14 days before the onset of treatment activities during the breeding season (approximately February 1 through August 31, as determined by a qualified biologist), a qualified biologist familiar with birds of California and with experience conducting nesting bird surveys will conduct focused surveys for white-tailed kites, northern harrier, other nesting raptors and other native birds and will identify active nests within 500 feet of the site.
- Because the nests of yellow warbler are small and difficult to find, occupancy of suitable habitat (i.e., riparian woodland) for this species will be determined by a qualified biologist familiar with the life history of yellow warbler and with experience identifying the calls of yellow warbler. If yellow warblers are observed calling, exhibiting territorial displays, carrying nest materials, carrying prey, or other signs of breeding behavior, the habitat will be considered occupied.
- Impacts on nesting birds will be avoided by establishing appropriate buffers around active nest sites identified during focused surveys to prevent disturbance to the nest. Activity will not commence within the buffer areas until a qualified biologist has determined that the young have fledged, the nest is no longer active, or reducing the buffer will not likely result in nest abandonment. An avoidance buffer of 0.25 mile will be implemented for white-tailed kite, in consultation with CDFW. For other species, a qualified biologist will determine the size of the buffer for non-raptor nests after a site- and nest-specific analysis. Buffers typically will be 500 feet for raptors (other than white-tailed kite) and 100 feet for non-raptor species. Factors to be considered for determining buffer size will include presence of natural buffers provided by vegetation or topography, nest height above ground, baseline levels of noise and human activity, species sensitivity, and expected treatment activities. The size of the buffer may be adjusted if a qualified biologist determines that such an adjustment would not be likely to adversely affect the nest. Any buffer reduction for a special-status species (i.e., white-tailed kite, northern harrier, yellow warbler) from the typical size (i.e., 0.25 mile, 500 feet, 100 feet, respectively) will require consultation with CDFW. Periodic monitoring of the nest by a qualified biologist during and after treatment activities will be required if the activity has potential to adversely affect the nest, the buffer has been reduced, or if birds within active nests are showing behavioral signs of agitation (e.g., standing up from a brooding position, flying off the nest) during treatment activities, as determined by the qualified biologist.
- Removal of golden eagle nests is prohibited regardless of the occupancy status under the federal Bald and Golden Eagle Protection Act. If golden eagle nests are found during focused surveys, then the nest tree shall not be removed.

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. These EPMs would minimize direct and indirect impacts on nesting birds.

Implementation of the Identified Treatment Projects would result in treatment activities within approximately 7 acres of oak-bay woodland, 10.5 acres of scrub habitat, 79 acres of eucalyptus forest, 21 acres of coniferous forest, and 3.8 acres of successional grassland habitat; all within which native birds may nest (Table 3.5-4). If nesting raptors and other native nesting birds are present within or adjacent to this habitat, implementation of treatment activities could result in adverse effects on these species even with implementation of the EPMs. Tree, shrub, and other vegetation removal associated with manual or mechanical treatments could result in removal of nests or direct injury or mortality to nesting birds. The presence of vehicles, equipment, and personnel associated with treatment activities could result in disturbance potentially leading to abandonment of active nests which could result in loss of eggs or chicks. This would be a **significant** impact.

Mitigation Measures

Mitigation Measure BIO-2f: Conduct Focused Surveys for Nesting Raptors and Other Native Nesting Birds and Implement Protective Buffers

Significance after Mitigation

WVFMP and Identified Treatment Projects

Mitigation Measures BIO-1a (for WVFMP only) and BIO-2f would reduce potential impacts on special-status birds, nesting raptors, and other native nesting birds by requiring reconnaissance-level surveys for biological resources to confirm the likelihood of nesting birds to be present within a treatment area, avoidance of treatment projects during the nesting season, focused nest surveys within treatment areas where presence is likely and treatment activities are planned for the nesting season, and implementation of no-disturbance buffers around active nests. With implementation of these mitigation measures, disturbance, injury, or mortality would be avoided for raptor species and minimized or avoided for non-raptor species. Additionally, treatment activities would not substantially affect the abundance, distribution, and viability of local or regional bird populations with implementation of these mitigation measures. This impact, for both the overall WVFMP and Identified Treatment Projects, would be reduced to **less than significant**.

Monarch Butterfly

Monarch butterfly is not officially listed under CESA or ESA or considered a CDFW species of special concern; however, CDFW monitors overwintering colonies of this species because monarch populations in California have severely declined since the 1980s (Xerces 2017). The cause of this decline is thought to be loss of milkweed (*Asclepias* spp.) and nectar plants; loss and degradation of overwintering groves; and other stressors like disease, insecticides, and impacts of climate change (Xerces 2017). The monarch overwintering season is typically October to March. There are 11 known overwintering sites in Alameda County (Xerces 2016), and while these sites are not within the Plan Area or the City of Berkeley, the Plan Area contains potentially suitable overwintering habitat within coniferous forest and eucalyptus groves. Monarchs do not favor eucalyptus trees; however, most of the overwintering locations in California are within eucalyptus groves simply because of their abundance in coastal areas in the state (Xerces 2017). Eucalyptus groves tend to provide the dense foliage, wind protection, and microclimate conditions required by monarchs, although native trees also provide these conditions and are the dominant tree species at some overwintering sites along the California coast (Xerces 2017). Within the Plan Area, native trees that could be used by overwintering monarchs include coast live oak and redwood (Xerces 2017).

Overall WVFMP (Program-level Analysis)

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on monarch (i.e., EPM BIO-1, BIO-3, BIO-4, BIO-5, BIO-6, HYD-2, and HAZ-5). However, treatment activities implemented as part of future projects under the WVFMP would include removal of nonnative conifer trees and eucalyptus trees. If these trees are removed during the overwintering season (October to March), overwintering colonies may be inadvertently removed and individual monarchs may be injured or killed, if present even with implementation of the EPMs. Treatment activities, including vegetation removal (i.e., manual or mechanical), prescribed broadcast burning, and use of heavy machinery, that occur in the vicinity of a monarch overwintering colony could result in inadvertent disturbance to the colony and possible abandonment. As a result of the scarcity of overwintering habitat in California and the declining status of the monarch population, loss of monarchs or destruction of overwintering colonies would be a **significant** impact.

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure BIO-2g: Conduct Focused Surveys for Monarch Overwintering Colonies and Implement Avoidance Measures

If it is determined that a monarch overwintering colony or suitable overwintering habitat is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented:

- To minimize the potential for loss of monarch overwintering colonies, treatment activities within suitable overwintering habitat (e.g., coniferous forest, eucalyptus forest) will be conducted from April through September to avoid the overwintering season (October through March), if feasible. If treatment activities are conducted outside of the overwintering season, no further mitigation will be required.
- Within 14 days before the onset of treatment activities between October 1st and March 31st, a qualified biologist familiar with monarchs and monarch overwintering habitat will conduct focused surveys for monarch colonies within suitable habitat in the treatment area and will identify and any colonies found within the treatment area.
- Monarch overwintering colonies that are identified within a treatment area will be demarcated with flagging or high-visibility construction fencing to prevent removal of the stand of trees containing the overwintering colony and encroachment by heavy machinery, vehicles, or personnel. Removal of the tree or stand of trees that contains the overwintering colony will not occur until the monarchs have left the area, as determined by a qualified biologist.
- If modification or removal of a stand that contains an identified overwintering colony is required to meet treatment objectives and cannot be delayed, UC Berkeley will prepare and implement a site-specific treatment plan for the stand with the goal of maintaining habitat function for the monarch overwintering colony, following feasible recommendations from *Protecting California's Butterfly Groves Management Guidelines for Monarch Butterfly Overwintering Habitat* (Xerces 2017). Examples of management strategies that could be considered to maintain habitat function include:
  - remove or trim hazard trees;
  - selectively remove or trim of trees to create a heterogeneous habitat that provides access to sunlight and shade for monarchs;
  - maintain suitable wind protection in the stand; and
  - replace removed trees with native trees in strategic locations to provide additional wind protection.

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. These EPMs would minimize direct and indirect impacts on special-status wildlife species. However, treatment activities within Identified Treatment Projects would include removal of nonnative conifer trees and eucalyptus trees. If these trees are removed during the overwintering season

(October to March), overwintering colonies may be inadvertently removed and individual monarchs may be injured or killed, if present even with implementation of the EPMs. Treatment activities, including vegetation removal (i.e., manual or mechanical), prescribed broadcast burning, and use of heavy machinery, that occur in the vicinity of a monarch overwintering colony could result in inadvertent disturbance to the colony and possible abandonment. As a result of the scarcity of overwintering habitat in California and the declining status of the monarch population, loss of monarchs or destruction of overwintering colonies would be a **significant** impact.

Mitigation Measures

Mitigation Measure BIO-2g: Conduct Focused Surveys for Monarch Overwintering Colonies and Implement Avoidance Measures

Significance after Mitigation

WVFMP and Identified Treatment Projects

Mitigation Measures BIO-1a (for WVFMP only) and BIO-2g would reduce potential impacts on monarch by requiring reconnaissance-level surveys for biological resources to confirm the likelihood of the presence of overwintering colonies within a treatment area, avoidance of treatment activities in suitable habitat during the monarch overwintering season, focused surveys for overwintering colonies within treatment areas where presence is likely, avoidance of identified colonies, and maintenance of habitat function through restoration of native tree species. With implementation of these mitigation measures, disturbance, injury, or mortality of monarchs would be avoided, and treatment activities would not substantially affect the abundance, distribution, and viability of local or regional populations. This impact, for both the overall WVFMP and Identified Treatment Projects, would be reduced to **less than significant**.

American Badger

American badger is a CDFW species of special concern. This species occurs throughout California and is associated with various habitat types including shrubland, woodland, forest, and grassland habitats, with friable soils. The Plan Area contains potentially suitable grassland and scrub habitat for this species. While habitat adjacent to developed areas associated with UC Berkeley and Lawrence Berkeley National Laboratory would provide only marginal habitat for this species, there is suitable contiguous habitat east of the Plan Area.

Overall WVFMP (Program-level Analysis)

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on American badger (i.e., EPM BIO-1, BIO-3, BIO-4, BIO-5, BIO-6, HYD-2, and HAZ-5). However, treatment activities within suitable grassland or scrub habitat for American badger may result in inadvertent disturbance, injury, or mortality of individuals or destruction of burrows even with implementation of the EPMs. If present, American badger could be disturbed by the presence of equipment and personnel and could be inadvertently injured or killed by heavy machinery, personnel, vehicles, and fire from prescribed broadcast burning. Additionally, pile burning could result in adverse effects on American badger if the piles are placed on or near burrows. This impact would be **significant**.

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure BIO-2h: Conduct Focused American Badger Survey and Establish Protective Buffers

If it is determined that suitable habitat for American badger is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented for treatment projects under the WVFMP:

- Within 30 days before commencement of treatment activities, a qualified wildlife biologist with familiarity with American badger and experience using survey methods for the species will conduct focused surveys of suitable habitat within the treatment area to identify any American badger burrows or dens.
- If occupied burrows are not found, further mitigation is not required.
- If occupied burrows are found, impacts on active badger dens will be avoided by establishing exclusion zones around all active badger dens, the size of which will be determined by the qualified biologist. No treatment activities will occur within the exclusion zone until denning activities are complete or the den is abandoned, as confirmed by a qualified biologist. The qualified biologist will monitor each den once per week to track the status of the den and to determine when it is no longer occupied. When it is no longer occupied, treatment activities within the exclusion zone may occur.

<u>Identified Treatment Projects (Project-level Analysis)</u>

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. These EPMs would minimize direct and indirect impacts on American badger.

Implementation of the Identified Treatment Projects would result in treatment activities within approximately 7 acres of oak-bay woodland, 10.5 acres of scrub habitat, 79 acres of eucalyptus forest, 21 acres of coniferous forest, and 3.8 acres of successional grassland habitat; American badger could occur within any of these (Table 3.5-4). If American badgers are present within or adjacent to this habitat, implementation of treatment activities could result in adverse effects on this species even with implementation of the EPMs. Ground disturbance associated with manual or mechanical treatments could result in disturbance or destruction of burrows or direct injury or mortality to individual badgers or young. The presence of vehicles, equipment, and personnel associated with treatment activities could result in disturbance potentially leading to abandonment of active burrows which could result in loss of young. This would be a **significant** impact.

Mitigation Measures

Mitigation Measure BIO-2h: Conduct Focused American Badger Survey and Establish Protective Buffers

<u>Significance after Mitigation</u>

WVFMP and Identified Treatment Projects

Mitigation Measures BIO-1a (for WVFMP only) and BIO-2h would reduce potential impacts on American badger by requiring reconnaissance-level surveys for biological resources to confirm the likelihood of the species to be present within a treatment area, focused badger surveys within treatment areas where presence is likely, and implementation of no-disturbance buffers around active burrows, if detected. With implementation of these mitigation measures, disturbance, injury, or mortality would be avoided or minimized and treatment activities would not substantially affect the abundance, distribution, and viability of the population. This impact, for both the overall WVFMP and Identified Treatment Projects, would be reduced to **less than significant**.

Mountain Lion

In April of 2020, the California Fish and Game Commission determined that listing of the Central Coast and Southern California ESU of mountain lion under CESA may be warranted. As a result, mountain lions within these ESUs are candidates for listing, and are thus protected under CESA. The Plan Area is within the Central Coast North ESU, which includes mountain lions in the Santa Cruz Mountains and the East Bay Hills. Mountain lions occupy a variety of habitats but are most abundant in riparian habitats. Habitat use is typically associated with prey availability (e.g., mule deer). Mountain lion home ranges can be greater than 200 square miles, though home ranges typically range from 5 to 100 square miles (Allen et al. 2015). Mountain lions are primarily nocturnal and are typically most active during dawn and dusk. While the Plan Area contains some areas of relatively undeveloped habitat (e.g., scrub, woodland, forest), it also contains development associated with UC Berkeley and Lawrence Berkeley National Laboratory, including buildings, parking lots, roads, and trails; all of which are used regularly by people and vehicles. Suitable denning habitat for mountain lions includes caves, other natural cavities, and thickets. Habitat within the Plan Area is likely marginal for mountain lion denning because of nearby development and relatively heavy human use; however, it is possible that mountain lions may traverse through the Plan Area while in transit to open space areas surrounding the Plan Area, and that the large home ranges of these species could overlap with the Plan Area.

<u>Overall WVFMP (Program-level Analysis)</u>

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on mountain lion (i.e., EPM BIO-1, BIO-3, BIO-4, BIO-5, BIO-6, HYD-2, and HAZ-5). As explained above, suitable denning habitat within the Plan Area is marginal and occurrences of the species would be rare and likely associated with mountain lions transiting through the Plan Area to surrounding open space areas. Treatment activities would occur during daylight hours and no nighttime activities would occur, which would reduce the likelihood of mountain lion presence within an active treatment area and subsequent direct impacts on the species. Treatment activities would involve temporary use and staging of equipment and vehicles, which would not result in permanent indirect impacts on movement of mountain lions through the Plan Area. Treatment objectives, which include removal of nonnative vegetation and restoration of native habitats (e.g., scrub, woodland, forest), could eventually improve the habitat within the Plan Area as a movement corridor for mountain lions because overgrown nonnative vegetation (e.g., eucalyptus, French broom) would be thinned.

There is a likelihood that mountain lions would occur within the Plan Area but treatment activities would not occur when mountain lions would be active, and as a result it is unlikely that implementation of projects under the WVFMP would result in direct or indirect adverse effects on mountain lions. However, although unlikely, there is a possibility that a mountain lion could use rocky areas or areas with thick vegetation in the Plan Area for denning. If a mountain lion den is present within the Plan Area, mountain lions and cubs could be disturbed by the presence of equipment and personnel and could be inadvertently injured or killed by heavy machinery, personnel, vehicles, and fire from prescribed broadcast burning. Additionally, pile burning could result in adverse effects on mountain lions if the piles are placed on or near a den site. This impact would be **significant**. Refer also to Impact BIO-5 for analysis of impacts to wildlife movement corridors.

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure BIO-2i: Conduct Focused Noninvasive Surveys for Mountain Lion Dens and Implement Avoidance Measures

If it is determined that potentially suitable den habitat (e.g., caves, other large natural cavities, thickets) for mountain lion is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a) or signs of mountain lion activities are observed (e.g., tracks, scat, carcasses or bones of prey species), the following measures will be implemented for treatment projects under the WVFMP:

- Within at least 30 days before commencement of treatment activities, a qualified wildlife biologist with familiarity with mountain lion and experience using survey methods for the species will conduct focused surveys of suitable habitat within the treatment area to identify any potential mountain lion dens. Potential mountain lion dens include caves, large natural cavities within rocky areas, or thickets deemed appropriate for use by mountain lions based on size and other characteristics (e.g., proximity to human development, surrounding habitat). The qualified wildlife biologist will also survey for signs of mountain lion (e.g., tracks, scat, carcasses or bones of prey species) in the vicinity of the cave, cavity, or thicket to help determine whether the den may be occupied by mountain lions.

- If no potential dens are found, no further mitigation is required.
- If potential dens are found, further investigation will be required to determine if the den is being used by a mountain lion or another carnivore species (e.g., coyote [*Canis latrans*], bobcat [*Lynx rufus*]). Survey methods will include the use of trail cameras, track plates, hair snares, or other noninvasive methods. Surveys using these noninvasive methods will be conducted for three days and three nights to determine whether the den is occupied by mountain lions.
  - If the den is determined to be unoccupied by mountain lion, no further mitigation is required. However, dens occupied by another carnivore species will not be disturbed or destroyed while any young are dependent on the den (in compliance with California Fish and Game Code sections on furbearers).
  - If the den is determined to be occupied by mountain lion, UC Berkeley will notify and consult with CDFW to identify adequate seasonal restrictions and/or no disturbance buffers to avoid disturbance, injury, or mortality of mountain lion.

<u>Identified Treatment Projects (Project-level Analysis)</u>

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. These EPMs would minimize direct and indirect impacts on mountain lion. As explained above, suitable denning habitat within the Plan Area, including Identified Treatment Project areas, is marginal and occurrences of the species would be rare and likely associated with mountain lions transiting through the Plan Area to surrounding open space areas. Treatment activities would occur during daylight hours and no nighttime activities would occur, which would reduce the likelihood of mountain lion presence within an active treatment area and subsequent direct impacts on the species. Treatment activities would involve temporary use and staging of equipment and vehicles, which would not result in permanent indirect impacts on movement of mountain lions through the Plan Area. Treatment objectives, which include removal of nonnative vegetation and restoration of native habitats (e.g., scrub, woodland, forest) could eventually improve the habitat within the Plan Area as a movement corridor for mountain lions because overgrown nonnative vegetation (e.g., eucalyptus, French broom) would be thinned.

There is a likelihood that mountain lions would occur within the Identified Treatment Project areas, but treatment activities would not occur when mountain lions would be active; therefore, it is unlikely that implementation of Identified Treatment Projects would result in direct or indirect adverse effects on mountain lions. However, there is a remote possibility that a mountain lion could use rocky areas or areas with thick vegetation within Identified Treatment Project areas for denning. If a mountain lion den is present within an Identified Treatment Project area, mountain lions and cubs could be disturbed by the presence of equipment and personnel and could be inadvertently injured or killed by heavy machinery, personnel, and vehicles. This impact would be **significant**. Refer also to Impact BIO-5 for analysis of impacts to wildlife movement corridors.

Mitigation Measures

Mitigation Measure BIO-2i: Conduct Focused Noninvasive Surveys for Mountain Lion Dens and Implement Avoidance Measures

<u>Significance after Mitigation</u>

WVFMP and Identified Treatment Projects

Mitigation Measures BIO-1a (for WVFMP only) and BIO-2i would reduce potential impacts on mountain lion by requiring reconnaissance-level surveys for biological resources to confirm the likelihood of the species to be present within a treatment area, focused surveys for active dens within treatment areas where presence of dens is likely, and implementation of impact avoidance measures to avoid disturbance, injury, or mortality of mountain lions. With implementation of these measures, treatment activities would not substantially affect the abundance, distribution, and viability of the population, and this impact, for both the overall WVFMP and Identified Treatment Projects, would be reduced to **less than significant**.

San Francisco Dusky-Footed Woodrat

San Francisco dusky-footed woodrat is a CDFW species of special concern. This species occurs in the San Francisco Bay Area within forest, woodland, scrub, and chaparral habitats with moderate canopy coverage and moderate to dense understory density. Woodrats construct nests, which are also known as houses or middens, with shredded grass, leaves, and other material. These nests can persist for decades, and are used for nesting, denning, and food storage. Suitable habitat for San Francisco dusky-footed woodrat, including woodland, forest, and scrub, is present throughout the Plan Area.

Overall WVFMP (Program-level Analysis)

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on San Francisco dusky-footed woodrat (i.e., EPM BIO-1, BIO-3, BIO-4, BIO-5, BIO-6, HYD-2, and HAZ-5). Even with implementation of EPMs, treatment activities within suitable woodland, forest, or scrub habitat for this species may result in inadvertent disturbance, injury, or mortality of individuals or destruction of nests. If present, San Francisco dusky-footed woodrats could be disturbed by the presence of equipment and personnel and could be inadvertently injured or killed or have their nests destroyed by heavy machinery, personnel, vehicles, and fire from prescribed broadcast burning. Additionally, pile burning could result in adverse effects on San Francisco dusky-footed woodrat if the piles are placed on or near nests. This impact would be **significant**.

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure BIO-2j: Conduct Focused Surveys for San Francisco Dusky-Footed Woodrat; Implement Avoidance Measures, or Relocate Nests

If it is determined that suitable habitat (e.g., woodland, forest, scrub) for San Francisco dusky-footed woodrat is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented for treatment projects under the WVFMP:

- Within seven days before initiation of treatment activities, a qualified biologist with familiarity with woodrats and experience conducting woodrat surveys will conduct a focused survey for San Francisco dusky-footed woodrat nests within the treatment area, within all associated access roads and staging areas, and within a sufficient buffer surrounding these areas where indirect disturbance could occur, as determined by the qualified biologist.
- If no woodrat nests are found during the focused survey, the qualified biologist will submit a letter report summarizing the results of the survey to UC Berkeley, and no further mitigation would be required.
- If woodrat nests are detected within the treatment area, the qualified biologist will determine whether the nest is active; this is typically determined through the presence of large amounts of scat. If active woodrat nests are present that can be avoided, the perimeter of these nests will be demarcated with high-visibility construction fencing to prevent accidental encroachment by vehicles, equipment, or personnel.
- If active woodrat nests within a treatment area are detected that cannot be avoided, and treatment activities are planned to occur during the woodrat breeding season (April through June), these active nests must be avoided until the end of the breeding season.
- If active woodrat nests within a treatment area cannot be avoided, and treatment activities are planned to occur outside of the woodrat breeding season, a qualified biologist in consultation with CDFW will dismantle the woodrat nest by hand, removing the materials layer by layer to allow adult woodrats to escape. If young are discovered

during the disassembling process, the qualified biologist will leave the area for at least 24 hours to allow the adult woodrats to relocate their young on their own.

- When the disassembly process is completed, the nest materials will be collected and moved to another suitable nearby location to allow for nest reconstruction.

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. These EPMs would minimize direct and indirect impacts on San Francisco dusky-footed woodrat.

San Francisco dusky-footed woodrat nest surveys were conducted in May and August of 2019, and 75 nests were located and mapped during these surveys (CCCI 2019c). Eighteen additional nests were mapped by SBI during reconnaissance-level surveys of the Plan Area in 2019. San Francisco dusky-footed woodrat nests were observed within the Strawberry, Frowning Ridge, and Claremont FHR project areas, as well as near several landings and temporary refuge areas (CCCI 2019c). However, surveys have not yet been completed for the entire treatment area of the Strawberry FHR, the Hearst Gate FB, the East-West FB, landings, TRA 1, and access trails. Additionally, because woodrat nests can become inactive or new nests can be built, additional nests may have been built since the nest surveys were completed.

Even with implementation of EPMs, within Identified Treatment Project areas that have not been fully surveyed, within the treatment areas where San Francisco dusky-footed woodrat nests have been detected, or where new woodrat nests have been established, treatment activities could result in disturbance or destruction of woodrat nests or disturbance, injury, or mortality of individuals. San Francisco dusky-footed woodrats could be disturbed by the presence of equipment and personnel and could be inadvertently injured or killed or have their nests destroyed by heavy machinery, personnel, vehicles, and fire form prescribed broadcast burning or pile burning. This impact would be **significant**.

Mitigation Measures

Mitigation Measure BIO-2j: Conduct Focused Surveys for San Francisco Dusky-Footed Woodrat, Implement Avoidance Measures, or Relocate Nests

Significance after Mitigation

WVFMP and Identified Treatment Projects

Implementation of Mitigation Measures BIO-1a (for WVFMP only) and BIO-2j would reduce potential impacts on San Francisco dusky-footed woodrat by requiring reconnaissance-level surveys for biological resources to confirm the likelihood of the species to be present within a treatment area; focused surveys for woodrat nests within treatment areas where presence is likely, within treatment areas where previous focused surveys were not conducted, and in areas where new woodrat nests may have been established; implementation of no-disturbance buffers if active nests are found that can be avoided; and relocation of active nests that cannot be avoided. Mitigation Measure BIO-2j will be implemented in all portions of Identified Treatment Projects that have not already been surveyed during 2019 focused surveys for San Francisco dusky-footed woodrat (CCCI 2019c) and also within the survey area to ensure that additional nests have not been established since the surveys were completed. With implementation of these mitigation measures, disturbance, injury, or mortality would be avoided or minimized and treatment activities would not substantially affect the abundance, distribution, and viability of the population. This impact, for both the overall WVFMP and Identified Treatment Projects, would be reduced to **less than significant**.

Pallid Bat, Townsend's Big-Eared Bat, and Western Red Bat

Three special-status bat species, pallid bat, Townsend's big-eared bat, and western red bat, could occur within the Plan Area, including the Identified Treatment Projects. All of these species are CDFW species of special concern. These species use a variety of habitats to roost, including caves, crevices, mines, hollow trees, and buildings. Potentially suitable roosting habitat is present within and adjacent to the Plan Area within crevices (e.g. exfoliating bark, cracks and fissures in tree stems or branches, crevices in research buildings), cavities (e.g. large tree hollows, unoccupied buildings), and foliage (e.g. clusters of leaves found in California bay, eucalyptus, willow, other tree species).

Overall WVFMP (Program-level Analysis)

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on special-status bat roosts (i.e., EPM BIO-1, BIO-3, BIO-4, BIO-5, BIO-6, HYD-2, and HAZ-5). However, if a future treatment project under the WVFMP contains potentially suitable woodland, forest, or human-made habitat (e.g., bridges, unoccupied buildings) for this species, then treatment activities may result in inadvertent disturbance, injury, or mortality of individuals or destruction of roost habitat even with implementation of the EPMs. Tree removal during manual or mechanical treatment activities could result in the direct loss of pallid bat roosts, if present. Additionally, treatment activities, including the use of vehicles and equipment and the presence of personnel could result in disturbance of pallid bat, Townsend's big-eared bats, or western red bat if present in the vicinity of these activities, potentially resulting in roost abandonment. This impact would be **significant**.

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure BIO-2k: Conduct Focused Bat Surveys and Implement Avoidance Measures

If it is determined that suitable roost habitat (e.g., woodland, forest, scrub) for pallid bat, Townsend's big-eared bat, or western red bat is present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented for treatment projects under the WVFMP:

- In the early planning stages of treatment projects, a qualified biologist with familiarity with bats and bat ecology, and experience conducting bat surveys will conduct surveys for bat roosts in suitable habitat (e.g., large trees, crevices, cavities, exfoliating bark, bridges, unoccupied buildings) within and adjacent to a treatment area.
- If no evidence of bat roosts is found, then no further study will be required.
- If evidence of bat roosts is observed, the species and number of bats using the roost will be determined. Bat detectors may be used to supplement survey efforts.
- A no-disturbance buffer of 250 feet will be established around active pallid bat, Townsend's big-eared bat, or western red bat roosts, and mechanical and manual treatments will not occur within this buffer. Prescribed broadcast burning activities and pile burning within this buffer will be implemented outside of the bat breeding season, which is April 1–August 31.

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. These EPMs would minimize direct and indirect impacts on special-status wildlife species.

However, even with implementation of the EPMs, treatment activities could result in inadvertent disturbance, injury, or mortality of these species or habitat modifications that lead to loss of habitat function (i.e., habitat unsuitability). Tree removal during manual or mechanical treatment activities could result in the direct loss of pallid bat or western red bat roosts, if present. Additionally, treatment activities, including the use of vehicles and equipment and the presence of personnel could result in disturbance of pallid bat, Townsend's big-eared bats, or western red bats if present in the vicinity of these activities, potentially resulting in roost abandonment. This impact would be **significant**.

Mitigation Measure BIO-2k: Conduct Focused Bat Surveys and Implement Avoidance Measures

<u>Significance after Mitigation</u>

WVFMP and Identified Treatment Projects

Mitigation Measures BIO-1a (for WVFMP only) and BIO-2k would reduce potential impacts on pallid bat, Townsend's big-eared bat, and western red bat by requiring reconnaissance-level surveys for biological resources to confirm the likelihood of the species to be present within a treatment area, focused surveys within suitable habitat in treatment areas where presence is likely, and implementation of no-disturbance buffers around bat roosts, if detected. With implementation of these mitigation measures, disturbance, injury, or mortality would be avoided or minimized and treatment activities would not substantially affect the abundance, distribution, and viability of the population. This impact, for both the overall WVFMP and Identified Treatment Projects, would be reduced to **less than significant**.

Impact BIO-3: Result in Degradation or Loss of Riparian Habitat or Other Sensitive Natural Communities

Vegetation treatment activities could result in loss or degradation of sensitive habitats, including designated sensitive natural communities and riparian habitat. EPMs would minimize impacts; however, treatment activities could still result in a loss of acreage of sensitive natural communities and riparian habitat, eliminate sensitive natural communities or riparian habitat from a treatment area, or reduce their habitat function. Loss or degradation of sensitive natural communities and riparian habitat would be a **significant** impact for the overall WVFMP as well as the Identified Treatment Projects.

<u>Overall WVFMP</u>

Sensitive natural communities are identified at the alliance level using the *Manual of California Vegetation* (Sawyer et al. 2009 or current version, including updated natural communities data at http://vegetation.cnps.org/). Sensitive natural communities are defined by unique assemblages of vegetation that may include, or even be dominated by, relatively common species, but it is the assemblage of species that is rare. California melic, Torrey's melic, foothill needle grass, and purple needle grass were observed within portions of Plan Area during special-status plant surveys in 2019 (CCCI 2019a). These species are associated with a sensitive natural community: valley needlegrass grassland. Habitat within the Plan Area where these species are present may qualify as a sensitive natural community based on the percentage of cover of the needlegrass and melic grass in proportion to other grass, forb, or shrub species. Additionally, other plant communities in the Plan Area may qualify as sensitive natural communities (e.g., California bay forest, redwood forest, arroyo willow thickets, blue elderberry shrubland) if the species assemblage, percent cover, and patch size are sufficient to meet membership rules and sensitive natural community requirements.

Riparian woodland habitat exists but has not been mapped in the Plan Area; it is present along some portions of Strawberry Creek, Claremont Creek, and other drainages throughout the Plan Area. The dominant species in this vegetation community is arroyo willow and the habitat also includes California bay, coast live oak, California blackberry, thimbleberry, and blue gum.

Many sensitive natural communities and sensitive habitats, like other native vegetation types, are currently degraded by fire suppression policies and other vegetation management practices that have altered ecosystem processes and changed species composition. Treatment activities may introduce disturbance regimes that are incompatible with the ecology of the specific sensitive natural communities present in a treatment area. Conversely, indirect beneficial effects from improved habitat conditions could result from implementation of the treatment types that restore ecosystem processes, conditions, and resiliency by moderating uncharacteristic wildland fuel conditions to reflect historic vegetative composition and structure that is characteristic of the sensitive natural community type.

EPM BIO-1 would require all material stockpiling and staging areas to be located within designated landings outside of sensitive habitats, which would reduce the likelihood of inadvertent disturbance or destruction of vegetation within sensitive natural communities and riparian habitat. EPM BIO-2 would require measures to reduce the likelihood of the spread or introduction of exotic plant species that may degrade sensitive natural communities and riparian habitat; including minimization of soil disturbance; use of native plants seeds or stock for erosion control; and the use of signs, fencing, or other measures to promote the ecological health of a treatment area. EPM BIO-4 would require Environmental Awareness Training for all staff involved with vegetation treatment activities, and this training would include the identification and ecological information for sensitive natural communities and riparian habitat that may potentially occur within a treatment area and describe the work practices necessary to effectively implement the EPMs and mitigation measures. EPM BIO-5 would require delineation of treatment areas and restriction of access outside of the treatment area to prevent impacts on sensitive biological resources, including sensitive natural communities and riparian habitat. EPM BIO-6 would require the use of existing roads, trails, and former logging paths to minimize ground disturbance from equipment and vehicles, which would further protect sensitive natural communities and riparian habitat, if present within a treatment area. EPM HYD-1 would require exclusion of managed herbivory activities within 50 feet of waterbodies, wetlands, or riparian areas; prohibition of cut material storage within 20 feet of a watercourse or swale; prohibition of the use of mechanical equipment within 50 feet of a watercourse; and prohibition of pile burning associated with biomass utilization within 25 feet of a watercourse. EPM HYD-2 would require the proper use of herbicides in the vicinity of aquatic habitat or riparian areas, including spill prevention, avoidance of herbicide use during precipitation events, and using only herbicides labeled for use in aquatic environments when working in riparian habitats. Finally, EPM HAZ-5 would prohibit spray applications of herbicides when wind speeds are 7 miles per hour or greater and requires the use of low-pressure spray nozzles kept within 24 inches of the target vegetation to reduce the risk of herbicide drift.

Manual Vegetation Treatment

Manual treatments would typically result in less ground disturbance than mechanical treatments; nonetheless, there is still a risk of trampling, breaking, or cutting nontarget vegetation, including species that characterize sensitive natural communities or habitats. Temporary ground disturbance could occur during treatment implementation, including turning soil where roots of invasive plants are pulled out; driving motorized vehicles, such as mowers, to access treatment sites and haul treated material off-site; and ground crews walking over vegetation. However, because manual treatments are implemented on a relatively small scale by trained individuals selectively treating targeted vegetation by hand, there is limited risk of removing non-targeted vegetation and this treatment type would generally not substantially alter riparian habitat or result in a loss of sensitive natural communities unless designed to do so as necessary to reduce wildfire risk.

Mechanical Vegetation Treatment

Mechanical treatments such as masticating, tilling, grubbing, and raking can disturb soil several inches below the surface affecting roots, rhizomes, bulbs and other underground parts of non-target vegetation, as well as the seedbed, and affecting soil stability. In addition, the removal of vegetation using mechanical treatments is less precise (in comparison to manual treatments); therefore, this treatment activity is used at sites where precision removal is not necessary. This treatment type could adversely modify habitat in a way that reduces survivorship, growth, and reestablishment of dominant or characteristic plant species or directly remove, crush, break, or otherwise destroy plants that make up sensitive natural communities and riparian habitat.

Prescribed Broadcast Burning

Prescribed broadcast burns could completely consume vegetation that characterizes sensitive natural communities or sensitive habitats or could reduce the viability of seedbanks of dominant vegetation if they are not adapted to fire or if the fire burns too hot. Prescribed broadcast burning has potential to reduce regeneration of sensitive natural communities and riparian habitat that are not adapted to fire.

Managed Herbivory

Non-target vegetation comprising a sensitive natural community or riparian habitat may be consumed or trampled by grazing livestock, potentially resulting in death or reduced reproduction and growth. Managed herbivory is typically used on a relatively small scale to reduce a target plant population, such as an invasive plant infestation, thereby reducing fire fuels or competition with desirable plant species.

Herbicide Application

Application of herbicides during treatment could damage or kill non-target vegetation through inadvertent direct application or through herbicide drift. Therefore, herbicide treatment has potential to kill vegetation that comprises sensitive natural communities and riparian habitat. Herbicide application would be achieved using targeted methods, including paint-on stem application and hand spray methods. These methods are more precise than other application methods (e.g., aerial spray) and would limit inadvertent application of herbicides on non-target vegetation. Additionally, as presented in Table 2.2 in Section 2, "Project Description," four of the six herbicides proposed for use are selective, which would reduce the risk of adverse effects to non-target vegetation. To avoid and minimize adverse effects from herbicide application on riparian habitats, which occur near water, EPM HYD-2 requires that herbicides that are not approved for aquatic use would not be used, stored, or mixed within 60 feet of any surface waters or wetlands. In addition, EPM HYD-2 specifies that herbicides cannot be applied when rain may rinse them off plants and into soil or water. EPM HAZ-5 would prohibit spray applications of herbicides when wind speeds are 7 miles per hour or greater and requires the use of low-pressure spray nozzles kept within 24 inches of the target vegetation to reduce the risk of herbicide drift.

Biomass Disposition

Several biomass disposition activities are relevant to biological resource impacts, including pile burning, spreading of chipped or masticated vegetation onsite, and leaving cut logs onsite. Pile burning could result in adverse effects on sensitive natural communities if the piles are placed within or near these sensitive habitats. Spreading of chipped vegetation or piling of cut logs could also result in adverse effects on sensitive habitats if the treated vegetation is spread or piled in riparian habitat areas.

Access Roads and Landings

Implementation of treatment activities under the WVFMP would include the use of existing access roads and landings. No new landings or access roads would be constructed under the WVFMP; however, some minor regrading and clearing to reestablish existing landings and an access road would be required. Grading for the access road would occur within 0.3 acre of an existing fire trail in the Plan Area to enable 4WD vehicle passage. Similar to mechanical treatments, grading in areas of sensitive natural communities or within riparian habitat would likely directly kill or damage these resources.

Treatment Maintenance and Monitoring

Follow-up maintenance and monitoring of treated areas would be implemented to retain the benefits of initial vegetation treatments. Post-treatment monitoring would be conducted immediately following vegetation treatments and on an annual basis to inform ongoing maintenance strategies. Maintenance treatments could be different than the original treatment used in the area but would not include any new treatment activities not discussed above.

<u>Summary</u>

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on sensitive natural communities and riparian habitat. However, even with implementation of the EPMs, if a treatment area contains valley needlegrass grassland, other potential sensitive natural communities (e.g., California bay forest, redwood forest, arroyo willow thickets, blue elderberry shrubland), or riparian habitat associated with creeks or drainages, then treatment activities may result in loss or degradation of these habitats such that their function would not be maintained. This impact would be **significant**.

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure BIO-3a: Conduct Protocol-Level Surveys for Sensitive Natural Communities and Riparian Habitat and Implement Avoidance Measures

If it is determined that sensitive natural communities or riparian habitat may be present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented before treatment:

- A qualified botanist will perform a protocol-level survey of the proposed treatment area for sensitive natural communities and sensitive habitats (including riparian habitat) following the CDFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018). Sensitive natural communities will be identified using the best available and current data, including keying them out using the most current edition of *A Manual of California Vegetation* (including updated natural communities data at http://vegetation.cnps.org/), or referring to relevant reports (e.g., reports found on the VegCAMP website).
- Before implementation of treatment activities, all sensitive habitats identified during surveys will be flagged or fenced with brightly visible construction flagging and/or fencing under the direction of the qualified biologist and no treatment activities will occur within these areas. Foot traffic by personnel shall also be limited in these areas to prevent the introduction of invasive or weedy species or inadvertent crushing of plants. Periodic inspections during construction shall be conducted by the monitoring biologist to maintain the integrity of exclusion fencing/flagging throughout the period of construction involving ground disturbance.

If after implementation of Mitigation Measure BIO-3a sensitive natural communities or riparian habitat are determined to be present within a treatment area and cannot be avoided because the treatment objectives cannot be met if the sensitive natural community or riparian habitat is avoided, the following measures will be implemented:

- A qualified botanist with knowledge of the affected sensitive natural community or riparian habitat will review the treatment design and applicable impact minimization measures (potentially including others not listed above) to determine if the implementation of the treatment is anticipated to result in a loss of habitat function (i.e., the location, essential habitat features, and species supported are not substantially changed) of the sensitive natural community or riparian habitat. Any loss of acreage of sensitive natural communities with a rarity rank of S1 or S2 would constitute a loss of habitat function. If a qualified botanist determines the habitat function will be maintained, such that the persistence and regeneration of the habitat would not be hindered, no further mitigation will be required. If a qualified botanist determines that the loss or degradation of sensitive natural communities or riparian habitat would result in loss of habitat function after implementing feasible treatment design modifications and impact minimization measures, then Mitigation Measure BIO-3b or Mitigation Measure BIO-3c will be implemented.
- The only exception to this mitigation approach is in cases where it is determined by a qualified botanist that the sensitive natural community or riparian habitat would benefit from treatment in the occupied area even though some loss may occur during treatment activities. For a treatment to be considered beneficial to a sensitive natural community or riparian habitat, the qualified botanist will demonstrate that habitat function is reasonably expected to improve with implementation of the treatment such that sensitive natural community or riparian habitat would expand, regenerate, or display increased vigor after treatment implementation. Evidence supporting this conclusion could include citing scientific studies demonstrating that the community or similar community has benefitted from increased sunlight as a result of canopy opening, eradication of invasive species, or otherwise reduced competition for resources. This demonstration will be documented in a letter report to UC Berkeley. If it is determined that treatment activities would be beneficial to sensitive natural communities or riparian habitat, no compensatory mitigation will be required.

Mitigation Measure BIO-3b: Compensate for Unavoidable Loss of Sensitive Natural Communities

If after implementation of Mitigation Measure BIO-3a sensitive natural communities are determined to be present within a treatment area and loss of habitat function would occur as specified under Mitigation Measure BIO-3a, the following measures will be implemented for treatment projects under the WVFMP:

- Compensate for unavoidable loss of any sensitive natural community habitat function such that no net loss of habitat function occurs by:
  - restoring sensitive natural community habitat function within the treatment area;
  - restoring degraded sensitive natural communities outside of the treatment area at a sufficient ratio to offset the loss of habitat function; or
  - preserving existing sensitive natural communities of equal or better value to the sensitive natural community affected through a conservation easement at a sufficient ratio to offset the loss of habitat function.
- UC Berkeley will prepare and implement a Compensatory Mitigation Plan that will include the following:
  - For preserving existing habitat outside of the treatment area in perpetuity, the Compensatory Mitigation Plan will include a summary of the proposed compensation lands (e.g., the number and type of credits, location of mitigation bank or easement), parties responsible for the long-term management of the land, and the legal and funding mechanism for long-term conservation (e.g., holder of conservation easement or fee title). UC Berkeley will provide evidence in the plan that the necessary mitigation has been implemented or that UC Berkeley has entered into a legal agreement to implement it and that compensatory habitat will be preserved in perpetuity.
  - For restoring or enhancing habitat within the treatment area or outside of the treatment area, the Compensatory Mitigation Plan will include a description of the proposed habitat improvements, success criteria that demonstrate the performance standard of maintained habitat function has been met, legal and funding mechanisms, and parties responsible for long-term management and monitoring of the restored or enhanced habitat.
  - Success criteria required to maintain habitat function for preserved and compensatory populations would include:
    - The extent of occupied area and density of plants associated with the sensitive natural community (number of plants per unit area) in compensatory habitats would be equal to or greater than the affected occupied habitat.
    - Compensatory and preserved sensitive natural communities would be self-producing. Populations would be considered self-producing when:
      - Plants associated with sensitive natural communities reestablish annually for a minimum of five years with no human intervention such as supplemental seeding; and
      - Reestablished and preserved habitats contain an occupied area and density comparable to existing occupied habitat areas in similar habitat types in the treatment area vicinity.

Mitigation Measure BIO-3c: Compensate for Unavoidable Loss of Riparian Habitat

If after implementation of Mitigation Measure BIO-3a riparian habitat is determined to be present within a treatment area and loss of habitat function would occur as specified under Mitigation Measure BIO-3a, the following measures will be implemented for treatment projects under the WVFMP:

- UC Berkeley will compensate for unavoidable losses of riparian habitat function such that no net loss of habitat function occurs by:
  - restoring riparian habitat function within the treatment area;
  - restoring degraded riparian habitat outside of the treatment area;
  - purchasing riparian habitat credits at a CDFW-approved mitigation bank; or

- preserving existing riparian habitat of equal or better value to the affected riparian habitat through a conservation easement at a sufficient ratio to offset the loss of riparian habitat function.

- UC Berkeley will prepare and implement a Compensatory Mitigation Plan that will include the following:
  - For preserving existing riparian habitat outside of the treatment area in perpetuity, the Compensatory Mitigation Plan will include a summary of the proposed compensation lands (e.g., the number and type of credits, location of mitigation bank or easement), parties responsible for the long-term management of the land, and the legal and funding mechanism for long-term conservation (e.g., holder of conservation easement or fee title). UC Berkeley will provide evidence in the plan that the necessary mitigation has been implemented or that UC Berkeley has entered into a legal agreement to implement it and that compensatory plant populations will be preserved in perpetuity.
  - For restoring or enhancing riparian habitat within the treatment area or outside of the treatment area, the Compensatory Mitigation Plan will include a description of the proposed habitat improvements, success criteria that demonstrate the performance standard of maintained habitat function has been met, legal and funding mechanisms, and parties responsible for long-term management and monitoring of the restored or enhanced habitat.
  - Compensatory mitigation may be satisfied through compliance with permit conditions, or other authorizations obtained by UC Berkeley (e.g., Lake and Streambed Alteration Agreement), if these requirements are equally or more effective than the mitigation identified above.

Mitigation Measure HYD-1: Establish Watercourse Protection Buffers

<u>Identified Treatment Projects (Project-level Analysis)</u>
The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. These EPMs would minimize direct and indirect impacts on sensitive natural communities and riparian habitat.

Surveys for sensitive natural communities were conducted within the Identified Treatment Project areas and other portions of the Plan Area in May of 2020 and two sensitive natural communities were observed within the Identified Treatment Project areas: bush monkeyflower scrub (0.06 acre) and California bay forest (4.49 acres) (CCCI 2020). Bush monkeyflower scrub habitat was observed within the East-West FB. California bay forest habitat was found within the following Identified Treatment Project areas: Claremont FHR (1.54 acres), Frowning FHR (0.77 acre), Strawberry FHR (0.38 acre), East-West FB (1.47 acres), TRAs (0.32 acre), and Fire Trail Access Road (0.02 acre). If treatment activities occur within the areas mapped as sensitive natural communities or directly adjacent to these occurrences, these habitats may be lost through direct removal of sticky monkeyflower shrubs or California bay trees, or degraded such that the habitat function would not be maintained or the habitat would no longer meet alliance qualifications for a sensitive natural community (e.g., percent cover of the dominant canopy species). This impact would be **significant**.

Mitigation Measure BIO-3a: Conduct Protocol-Level Surveys for Sensitive Natural Communities and Riparian Habitat and Implement Avoidance Measures and Mitigation

Mitigation Measure BIO-3b: Compensate for Unavoidable Loss of Sensitive Natural Communities

Mitigation Measure BIO-3c: Compensate for Unavoidable Loss of Riparian Habitat

Mitigation Measure HYD-1: Establish Watercourse Protection Buffers

Significance after Mitigation

WVFMP

Mitigation Measures BIO-1a, BIO-3a, BIO-3b, and BIO-3c would reduce potential impacts on sensitive natural communities and riparian habitat by requiring reconnaissance-level surveys for biological resources to confirm the likelihood of sensitive habitats to be present within a proposed treatment project area, protocol-level surveys within a treatment area to identify sensitive natural communities and riparian habitat, implementation of avoidance measures to prevent degradation or removal of these habitats, and compensation for unavoidable impacts on sensitive natural communities and riparian habitat. Mitigation Measure HYD-1 would require establishment of watercourse protection buffers within which certain activities could not be conducted and would preserve unburned vegetative buffers around watercourses within the Plan Area; these buffers would likely incorporate much of the riparian habitat associated with creeks and drainages. With implementation of these mitigation measures, loss or degradation of these habitats such that their function would not be maintained would be avoided or mitigated and this impact would be **less than significant**.

Identified Treatment Projects

Mitigation Measures , BIO-3a (except for protocol-level surveys, which were already conducted [CCCI 2020]), BIO-3b, and BIO-3c would reduce potential impacts on sensitive natural communities and riparian habitat by requiring implementation of avoidance measures to prevent degradation or removal of these habitats, determination of whether treatment activities would result in adverse or beneficial effects on habitat function of these habitats, and compensation for impacts on sensitive natural communities and riparian habitat. Mitigation Measure HYD-1 would require establishment of watercourse protection buffers, within which certain activities could not be conducted and would preserve unburned vegetative buffers around watercourses within the Plan Area; these buffers would likely incorporate much of the riparian habitat associated with creeks and drainages. With implementation of these mitigation measures, loss or degradation of these habitats such that their function would not be maintained would be avoided or mitigated and this impact would be **less than significant**.

Impact BIO-4: Substantially Adversely Affect State or Federally Protected Wetlands

Vegetation treatment activities could result in loss or degradation of state or federally protected wetlands through direct removal of wetland vegetation or alteration of wetland hydrology or topography resulting in loss or degradation of wetland functions. Implementation of EPMs would minimize impacts; however, treatment activities could inadvertently destroy or adversely modify protected wetlands resulting in loss of these resources. Additionally, prescribed broadcast burning would result in direct removal of wetland vegetation that could adversely modify wetland functions. The loss of wetland functions from ground disturbance or upland vegetation removal that alters hydrology, direct removal of wetland vegetation, or fill of wetlands or dredging through wetlands would be a **significant** impact for the overall WVFMP as well as the Identified Treatment Projects.

Overall WVFMP (Program-level Analysis)

Known aquatic habitat within the Plan Area includes Strawberry Creek, Claremont Creek, associated drainages, and ponds within the UC Berkeley Botanical Garden (Figure 3.5-1). Although no formal delineation has been conducted, these features are hydrologically connected to the San Francisco Bay/Pacific Ocean and would therefore be regulated by the U.S. Army Corps of Engineers under the federal Clean Water Act. Additionally, these features and associated habitat are likely waters of the state and/or under the regulatory authority of CDFW pursuant to California Fish and Game Code 1600 et seq. Additional state-protected wetland habitat (e.g., seasonal wetlands, swales, seeps) may be present within the Plan Area.

Treatment activities could inadvertently destroy or adversely modify protected wetlands resulting in loss of wetland functions from ground disturbance or upland vegetation removal that alters hydrology, direct removal of wetland vegetation, or fill of wetlands or dredging through wetlands (e.g., to establish containment lines for prescribed broadcast burning). Wetland functions include, but are not limited to, providing habitat for plants and wildlife, erosion control, sediment retention, and stormwater control. Water quality impacts to surface waters in the Plan Area are addressed in Section 3.9, "Hydrology and Water Quality."

EPM BIO-1 would require all material stockpiling and staging areas to be located within designated landings outside of sensitive habitats, which would reduce the likelihood of inadvertent modification or destruction of wetland habitat. EPM BIO-4 would require environmental awareness training for all staff involved with vegetation treatment activities, and this training would include the identification and presentation of ecological information for wetland habitats that may potentially occur within a treatment area and describe the work practices necessary to effectively implement the EPMs and mitigation measures. EPM BIO-5 would require delineation of treatment areas and restriction of access outside of the treatment area to prevent impacts on sensitive biological resources, including wetland habitat. EPM BIO-6 would require the use of existing roads, trails, and former logging paths to minimize ground disturbance from equipment and vehicles, which would further protect wetland habitat, if present within a treatment area. EPM HYD-1 would require exclusion of managed herbivory activities within 50 feet of waterbodies, wetlands, or riparian areas; prohibition of cut material storage within 20 feet of a watercourse or swale; prohibition of the use of mechanical equipment within 50 feet of a watercourse; and prohibition of pile burning associated with biomass utilization within 25 feet of a watercourse. EPM HYD-2 would require the proper use of herbicides in the vicinity of aquatic habitat or riparian areas, including spill prevention, avoidance of herbicide use during precipitation events, and using only herbicides labeled for use in aquatic environments when working in riparian habitats. Finally, EPM HAZ-5 would prohibit spray applications of herbicides when wind speeds are 7 miles per hour or greater and requires the use of low-pressure spray nozzles kept within 24 inches of the target vegetation to reduce the risk of herbicide drift.

Manual Vegetation Treatment

Manual treatments typically result in less ground disturbance than mechanical treatments; nonetheless, there is still a risk of trampling, breaking, or cutting nontarget vegetation, including wetland vegetation. Temporary ground disturbance could occur during treatment implementation, including turning soil where roots of invasive plants are pulled out; driving motorized vehicles, such as mowers, to access treatment sites and haul treated material off-site; and ground crews walking over vegetation. However, because manual treatments are implemented on a relatively small scale by trained individuals selectively treating targeted vegetation by hand, there is limited risk of removing non-targeted vegetation and this treatment type would generally not substantially alter wetland habitats or result in inadvertent disturbance, alteration, or fill of wetlands unless designed to do so as necessary to reduce wildfire risk.

Mechanical Vegetation Treatment

Mechanical treatments such as masticating, tilling, grubbing, and raking can disturb soil several inches below the surface. Removal of vegetation using mechanical treatments is less precise (in comparison to manual treatments); therefore, this treatment activity is used at sites where precision removal is not necessary. This treatment type could inadvertently destroy or adversely modify protected wetlands resulting in loss of these resources.

Prescribed Broadcast Burning

Prescribed broadcast burning could result in direct removal of wetland vegetation that could adversely modify and reduce wetland functions.

Managed Herbivory

Non-target wetland vegetation may be consumed by grazing livestock, and wetland habitat may be trampled by grazing livestock, potentially resulting in disturbance or fill of these features. Managed herbivory is typically used on a relatively small scale to reduce a target plant population, such as an invasive plant infestation, thereby reducing fire fuels or competition with desirable plant species. Temporary fencing would be installed which would exclude grazing livestock from riparian areas.

Herbicide Application

Application of herbicides during treatment could damage or kill non-target vegetation through inadvertent direct application or through herbicide drift. Therefore, herbicide treatment has potential to kill wetland vegetation. Herbicide application would be achieved using targeted methods, including paint-on stem application and hand spray methods. These methods are more precise than other application methods (e.g., aerial spray) and would limit inadvertent application of herbicides on non-target wetland vegetation. Additionally, as presented in Table 2.2 in Section 2, "Project Description," four of the six herbicides proposed for use are selective, which would reduce the risk of adverse effects on non-target vegetation. To avoid and minimize adverse effects from herbicide application on wetlands, EPM HYD-2 requires that herbicides that are not approved for aquatic use would not be used, stored, or mixed within 60 feet of any surface waters or wetlands. In addition, EPM HYD-2 specifies that herbicides cannot be applied when rain may rinse them off of plants and into soil or water. Furthermore, EPM HAZ-5 would prohibit spray applications of herbicides when wind speeds are 7 miles per hour or greater and requires the use of low-pressure spray nozzles kept within 24 inches of the target vegetation to reduce the risk of herbicide drift. Impacts to surface waters resulting from herbicide treatments are discussed in more detail in Section 3.9, "Hydrology."

Biomass Disposition

Several biomass disposition activities are relevant to biological resources, including burning of treated (e.g., cut, chopped) vegetation onsite in piles, spreading of chipped or masticated vegetation onsite, and leaving cut logs onsite. Pile burning could result in adverse effects on state or federally protected wetlands if the piles are placed within or near these sensitive habitats. Spreading of chipped vegetation or piling of cut logs could also result in adverse effects on wetlands if the treated vegetation is spread or piled on or near sensitive habitat areas.

Access Roads and Landings

Implementation of treatment activities under the WVFMP would include the use of existing access roads and landings. No new landings or access roads would be constructed under the WVFMP; however, some minor regrading and clearing to reestablish existing landings and an access road would be required. Grading for the access road would occur within 0.3 acre of an existing fire trail in the Plan Area to enable 4WD vehicle passage. Regrading of landings or access roads could inadvertently adversely modify watercourses, either directly or indirectly, with resultant effects to biological resources.

Treatment Maintenance and Monitoring

Follow-up maintenance and monitoring of treated areas would be implemented to retain the benefits of initial vegetation treatments. Post-treatment monitoring would be conducted immediately following vegetation treatments and on an annual basis to inform ongoing maintenance strategies. Maintenance treatments could be different than the original treatment used in the area but would not include any new treatment activities not discussed above.

Summary

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on state and federally protected wetlands. However, even with implementation of the EPMs, if a treatment area contains wetland habitat that has not been previously identified and marked for avoidance, then treatment activities may inadvertently destroy or adversely modify protected wetlands resulting in loss of wetland functions from ground disturbance or upland vegetation removal that alters hydrology, direct removal of wetland vegetation, or fill of wetlands or dredging through wetlands. This impact would be **significant**.

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure BIO-4a: Avoid State and Federally Protected Wetlands

If it is determined that wetland habitat may be present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented before treatment:

- A qualified biologist will delineate the boundaries of state or federally protected wetlands within the treatment area according to methods established in the USACE wetlands delineation manual (Environmental Laboratory 1987) and the Arid West regional supplement (USACE 2008).

- A qualified biologist will delineate the boundaries of wetlands that may not meet the definition of waters of the United States, but would qualify as waters of the state, according to the state wetland procedures.
- A qualified biologist will establish a buffer around wetlands and mark the buffer boundary with high-visibility flagging, fencing, stakes, or clear, existing landscape demarcations (e.g., edge of a roadway). The buffer will be a minimum width of 25 feet but may be larger if deemed necessary. The appropriate size and shape of the buffer zone will be determined in coordination with the qualified biologist and will depend on the type of wetland present (e.g., seasonal wetland, wet meadow, freshwater marsh, vernal pool), the timing of treatment (e.g., wet or dry time of year), whether any special-status species may occupy the wetland and the species' vulnerability to the treatment activities, environmental conditions and terrain, and the treatment activity being implemented.
- A qualified biologist will periodically inspect the materials demarcating the buffer to confirm that they are intact and visible, and wetland impacts are being avoided.
- Within this buffer, herbicide application is prohibited.
- Within this buffer, any ground disturbance is prohibited. Accordingly, the following activities are not allowed within the buffer zone: mechanical treatments, managed herbivory, and vehicle access or staging.
- Only prescribed burning may be implemented in wetland habitats if it is determined by a qualified biologist that:
  - No special-status species are present in the wetland habitat.
  - The wetland functions would be maintained.
  - The prescribed broadcast burn is within the normal fire return interval for the wetland vegetation types present.
  - Fire containment lines and pile burning are prohibited within the buffer.
  - No fire ignition (and associated use of accelerants) will occur within the wetland buffer.

Mitigation Measure HYD-1: Establish Watercourse Protection Buffers

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. Several drainages associated with Strawberry Creek and Claremont Creek run through the Strawberry FHR, Frowning FHR, Claremont FHR, Hearst Gate FB, and TRA 1 Identified Treatment Projects (Figure 3.5-1). The EPMs described above would minimize direct and indirect impacts on state or federally protected wetlands, including these previously identified drainages. However, if an Identified Treatment Project contains wetland habitat that has not been previously identified, then treatment activities may inadvertently destroy or adversely modify protected wetlands resulting in loss of wetland functions from ground disturbance or upland vegetation removal that alters hydrology, direct removal of wetland vegetation, or fill of wetlands or dredging through wetlands, even with implementation of the EPMs. This impact would be **significant**.

Mitigation Measure BIO-4a: Avoid State and Federally Protected Wetlands

Mitigation Measure HYD-1: Establish Watercourse Protection Buffers

<u>Significance after Mitigation</u>

WVFMP and Identified Treatment Projects

Mitigation Measures BIO-4a would reduce potential impacts on state and federally protected wetlands by requiring an aquatic resources delineation within a treatment area to identify wetland habitat and implementation of avoidance measures to prevent direct and indirect disturbance of wetlands. Mitigation Measure HYD-1 would require establishment of watercourse protection buffers, which would likely prevent most direct and indirect impacts on wetland habitats, and prohibit burn piles within watercourse protection buffers. With implementation of these measures, impacts to wetlands would be avoided. Treatments would not result in loss of wetland functions from ground disturbance or upland vegetation removal that alters hydrology, directly removes wetland vegetation, or fill or dredging of wetlands. This impact would be **less than significant**.

Impact BIO-5: Substantially Interfere with Wildlife Movement Corridors or Impede Use of Nurseries

Vegetation treatment activities could be located in areas used as wildlife movement corridors or nurseries. Treatment-related disturbance could lead to temporary changes in migration or movement patterns and fencing for managed herbivory could potentially injure or impede moving wildlife. Wildlife nursery sites could be disturbed or essential nursery habitat components could be degraded by vegetation treatment activities. Temporary shifts in wildlife movements to avoid or navigate around active treatment areas and associated disturbances would not substantially interfere with movement requirements or migration patterns, and project implementation would not create long-term barriers to local or landscape-level movements. However, even with implementation of the EPMs, the temporary use of fencing associated with managed herbivory could result in entanglement resulting in injury or mortality of wildlife if placed within wildlife movement corridors or if used improperly. Additionally, while implementation of EPMs would minimize impacts, nursery sites could still be removed, degraded, or disturbed during treatment activities. This would be a **significant** impact for the overall WVFMP as well as the Identified Treatment Projects.

<u>Overall WVFMP (Program-level Analysis)</u>

The Plan Area contains natural habitat areas, which likely function as wildlife movement corridors. Aquatic habitats within the Plan Area (i.e., Strawberry Creek, Claremont Creek, other drainages) likely serve as migratory corridors for fish, aquatic invertebrates, amphibians, and birds associated with riparian habitat. Terrestrial habitat within the Plan Area has been identified as an ECA connecting natural landscape blocks to the north, east, and south (Figure 3.5-2). These areas likely serve as migratory corridors for mammals (e.g., mountain lions, coyotes, gray foxes [*Urocyon cinereoargenteus*], mule deer) which would traverse through woodland, forest, or scrub habitat within the Plan Area to reach other habitat in surrounding open spaces.

Wildlife nursery sites include locations where fish and wildlife concentrate for hatching and/or raising young. Nursery sites that could occur within the Plan Area include heron rookeries, fawning areas for deer, maternal roosts for bats, or monarch overwintering colonies. Native nursery sites are not mapped on a regional scale and have not been mapped in the Plan Area or Identified Treatment Project areas.

Noise or visual disturbance as a result of the presence of equipment, personnel, or fire from prescribed broadcast burning and pile burning could cause resident or migratory wildlife to temporarily avoid or move out of the areas immediately surrounding treatment areas. These disturbances could temporarily disrupt the movement patterns of some wildlife species that may use treatment areas or adjacent lands for regular movements locally or for seasonal migrations. Additionally, access or use of any wildlife nursery sites (e.g., bat maternity roosts, deer fawning areas, heron or egret rookeries, monarch overwintering sites) present within or adjacent to active treatment areas could be disturbed or impeded temporarily by treatment activities, as explained further below. Implementation of treatment activities would typically occur over several weeks. Various heavy equipment (e.g., engines, dozers, masticators, water trucks, chippers) could be used and approximately 1-15 personnel could be present in a treatment area from dawn to dusk, depending on the treatment activity being implemented.

Most of the treatment activities in the Plan Area would occur in close proximity to human development associated with UC Berkeley. The general types and levels of disturbances (e.g., equipment noise, visual disturbance, human activity) from treatment activities near these developed areas (e.g., buildings, fire trails, public roads with consistent traffic) would likely be similar to existing disturbance levels in these areas. Wildlife near human development is likely accustomed to human presence and motorized vehicles (e.g., mule deer); therefore, any temporary incremental increases in noise and human disturbances from treatment activities in these areas are unlikely to substantially disrupt current movement patterns. Additionally, treatment activities would not create any temporary barriers to movement that would redirect migration during non-working hours (or for more than a few days in the case of managed herbivory, see next paragraph). Therefore, most treatment-related disturbances to local or regional wildlife movements would be temporary and relatively minor. However, if treatment activities were to occur adjacent to watercourses within the Plan Area (e.g., Strawberry Creek, Claremont Creek, drainages) or within associated riparian habitat, the quality of these habitats as movement corridors may be degraded.

Managed herbivory treatments may use fencing, typically low-voltage temporary electric fencing, for containing herbivores (e.g., sheep and goats). Electric fencing systems typically consist of two or three horizontal strands of electric wire or electric netting, posts staked in the ground, a solar panel, and a battery. Managed herbivory typically consists of fencing small areas (e.g., fewer than 5 acres) and moving fencing to a new area frequently (e.g., every few days), instead of fencing larger areas for longer periods. Most wildlife is likely to circumvent the fenced areas, which could temporarily displace wildlife from the area and cause minor shifts in movement patterns while navigating around the treatment area. While most wildlife species would be capable of avoiding fencing associated with managed herbivory, it is possible that deer could become ensnared while attempting to jump over the fencing or that birds or smaller wildlife species could become entangled in the netting while foraging near the ground or moving through the treatment area.

If nursery sites are present within proposed treatment areas under the WVFMP, treatment of vegetation containing an active nursery site could potentially cause the removal or abandonment of a wildlife nursery. For example, treatment activities could remove trees containing a bat maternity roost or a bird nesting colony. In addition, treatment-related noise and human disturbance near nursery sites could result in temporary avoidance, changes in behavior, separation of adults and young, or, if the disturbance is severe, abandonment of the nursery site. These disturbances and behavioral responses could decrease the reproductive success of the affected population.

EPM BIO-1 would require all material stockpiling and staging areas to be located within designated landings outside of sensitive habitats, which would reduce the probability of materials and equipment impeding the movement of wildlife. EPM BIO-3 would require any wildlife species encountered during treatment activities to be allowed to leave the treatment area unharmed. EPM BIO-4 would require environmental awareness training for all staff involved with vegetation treatment activities, and this training would include the identification of important wildlife movement corridors and wildlife nurseries that occur within a treatment area and describe the work practices necessary to effectively implement the EPMs and mitigation measures. EPM BIO-5 would require delineation of treatment areas and restriction of access outside of the treatment area to prevent impacts on sensitive biological resources, including wildlife nursery sites. EPM BIO-6 would require the use of existing roads, trails, and former logging paths to minimize ground disturbance from equipment and vehicles, which would further protect wildlife habitat that may be used for movement or as nursery sites. Finally, EPM HYD-1 would require exclusion of managed herbivory activities within 50 feet of waterbodies, wetlands, or riparian areas; prohibition of cut material storage within 20 feet of a watercourse or swale; prohibition of the use of mechanical equipment within 50 feet of a watercourse; and prohibition of pile burning associated with biomass utilization within 25 feet of a watercourse.

Relevant EPMs, as described above, would be implemented for all treatments implemented under the WVFMP, which would minimize direct and indirect impacts on wildlife movement corridors or native wildlife nursery sites. However, fencing used in implementation of managed herbivory treatments under the WVFMP could result in impediments to wildlife movement. Treatment activities within or adjacent to aquatic habitat could result in degradation of this habitat, which would reduce its function as a wildlife movement corridor. Additionally, if a treatment implemented under the WVFMP contains a wildlife nursery site, the nursery site could be removed, degraded, disturbed, or its use by wildlife otherwise impeded by treatment activities. Some nursery sites contain a large number of individuals and disturbance or loss of these nurseries could have a substantial effect on reproductive success of the local or regional population. The potential interference with wildlife movement corridors and impediment of the use of nursery sites would be **significant**.

Mitigation Measures

Mitigation Measure BIO-1a: Conduct Project-level Biological Reconnaissance Survey

Mitigation Measure BIO-2g: Conduct Focused Surveys for Monarch Overwintering Colonies and Implement Avoidance Measures

Mitigation Measure BIO-3a: Conduct Protocol-Level Surveys for Sensitive Natural Communities and Riparian Habitat and Implement Avoidance Measures and Mitigation

Mitigation Measure BIO-3b: Compensate for Unavoidable Loss of Sensitive Natural Communities

Mitigation Measure BIO-3c: Compensate for Unavoidable Loss of Riparian Habitat

Mitigation Measure BIO-5a: Install Wildlife-Friendly Fencing for Managed Herbivory Treatments

Mitigation Measure BIO-5b: Retain Nursery Habitat and Implement Buffers to Avoid Nursery Sites

If it is determined that wildlife nursery sites are present within a treatment area (e.g., through implementation of Mitigation Measure BIO-1a), the following measures will be implemented before implementation of treatment activities. In addition, if more than one year between completion of the data review and reconnaissance survey from Mitigation Measure BIO-1a has occurred, the data review and reconnaissance survey will be updated to determine if wildlife nursery sites are present within a treatment area:

- **Retain Known Nursery Sites.** A qualified biologist will identify the important habitat features of the wildlife nursery and, prior to treatment activities, will mark these features for avoidance and retention during treatment to maintain the function of nursery habitat.
- **Establish Avoidance Buffers.** UC Berkeley will establish a no-disturbance buffer around the nursery site if activities are required while the nursery site is active/occupied. The appropriate size and shape of the buffer will be determined by a qualified biologist, based on potential effects of treatment project-related habitat disturbance, noise, visual disturbance, and other factors. No treatment activity will commence within the buffer area until a qualified biologist confirms that the nursery site is no longer active/occupied. Monitoring of the effectiveness of the no-disturbance buffer around the nursery site by a qualified biologist during and after treatment activities will be required. If treatment activities cause agitated behavior of the individual(s), the buffer distance will be increased, or treatment activities modified until the agitated behavior stops. The qualified biologist will have the authority to stop any treatment activities that could result in potential adverse effects to wildlife nursery sites.

Mitigation Measure HYD-1: Establish Watercourse Protection Buffers

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP for those treatment activities. Herbicide application would be implemented following removal of vegetation through manual or mechanical vegetation treatments. Prescribed broadcast burning and managed herbivory would not be implemented. Biomass disposal and utilization methods would be the same as the overall WVFMP, although no pile burning would occur. Data review and biological reconnaissance surveys by SBI in 2019 did not identify any wildlife nurseries; however, if a wildlife nursery site is established in the identified treatment area before treatment begins, these nursery sites could be affected. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects; although, the interference with movement from fencing for managed herbivory would not occur. EPMs would minimize direct and indirect impacts on wildlife movement corridors or native wildlife nursery sites. Even with implementation of EPMs, proposed treatment activities within or adjacent to aquatic habitat could result in degradation of this habitat, which would reduce its function as a wildlife movement corridor. If present within a treatment area, nursery sites could be removed, degraded, disturbed, or their use by wildlife otherwise impeded by treatment activities. Some nursery sites contain a large number of individuals and disturbance or loss of these nurseries could have a substantial effect on reproductive success of the local or regional population. The potential interference with wildlife movement corridors and impediment of the use of nursery sites would be **significant**.

Mitigation Measure BIO-2g: Conduct Focused Surveys for Monarch Overwintering Colonies and Implement Avoidance Measures

Mitigation Measure BIO-3a: Conduct Protocol-Level Surveys for Sensitive Natural Communities and Riparian Habitat and Implement Avoidance Measures and Mitigation

Mitigation Measure BIO-3b: Compensate for Loss of Sensitive Natural Communities

Mitigation Measure BIO-3c: Compensate for Unavoidable Loss of Riparian Habitat

Mitigation Measure BIO-5b: Retain Nursery Habitat and Implement Buffers to Avoid Nursery Sites

Mitigation Measure HYD-1: Establish Watercourse Protection Buffers

<u>Significance after Mitigation</u>

WVFMP

Mitigation Measures BIO-1a, BIO-2g, BIO-3a, BIO-3b, BIO-3c would reduce potential impacts on wildlife movement corridors by requiring reconnaissance-level surveys for biological resources to determine the likelihood of sensitive habitats that may be used as wildlife movement corridors or wildlife nursery sites to occur within a treatment area, focused surveys for monarch overwintering sites, protocol-level surveys within a treatment area to identify sensitive natural communities and riparian habitat, implementation of avoidance measures to prevent disturbance or removal of these habitats, and compensation for impacts on sensitive natural communities and riparian habitat. Mitigation Measures BIO-5a and BIO-5b would reduce potential impacts on wildlife movement corridors and native wildlife nursery sites by requiring the use of wildlife-friendly fencing for managed herbivory treatments and requiring the retention of wildlife nursery site habitat and implementation of no-disturbance buffers to avoid impacts on these sites. Mitigation Measure HYD-1 would require establishment of watercourse protection buffers, which would likely incorporate much of the riparian habitat associated with creeks and drainages that likely functions as a wildlife movement corridor. Implementation of these mitigation measures would maintain the function of movement corridors and nursery habitat such that substantial interference or impediment of use by wildlife would not occur. Therefore, this impact would be **less than significant**.

Identified Treatment Projects

Mitigation Measures BIO-2g, BIO-3a, BIO-3b, and BIO-3c would reduce potential impacts on wildlife movement corridors by requiring focused surveys for monarch overwintering sites, protocol-level surveys within a treatment area to identify sensitive natural communities and riparian habitat, implementation of avoidance measures to prevent disturbance or removal of these habitats, and compensation for impacts on sensitive natural communities and riparian habitat. Mitigation Measure BIO-5b would reduce potential impacts on native wildlife nursery sites by requiring the retention of wildlife nursery site habitat and implementation of no-disturbance buffers to avoid impacts on these sites. Mitigation Measure HYD-1 would require establishment of watercourse protection buffers, which would likely incorporate much of the riparian habitat associated with creeks and drainages that likely functions as a wildlife movement corridor. Implementation of these mitigation measures would maintain the function of movement corridors and nursery habitat such that substantial interference or impediment of use by wildlife would not occur. Therefore, this impact would be **less than significant**.

Impact BIO-6: Conflict with Local Policies and Ordinances

There are several policies in the City of Berkeley, City of Oakland, Alameda County, and Contra Costa County general plans that protect biological resources. UC Berkeley is not subject to local governments' regulations; however, mitigation measures identified under Impacts BIO-1, BIO-2, BIO-3, BIO-4, and BIO-5 would reduce impacts to resources protected by local policies to less than significant. Therefore, impacts related to potential conflict with local policies or ordinances protecting biological resources would be **less than significant** for both the overall WVFMP as well as the Identified Treatment Projects.

Appendix G of the State CEQA Guidelines suggests evaluating whether a project would "conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect." As a constitutionally-created state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies. The city and county general plan policies discussed below provide a local context for the project; however, the cities of Berkeley and Oakland, and the counties of Alameda and Contra Costa are not agencies with jurisdiction over the project as described in Appendix G of the State CEQA Guidelines. Therefore, the discussion that follows is for informational purposes, not for determination of significance.

The City of Berkeley, City of Oakland, Alameda County, and Contra Costa County general plans include policies protecting biological resources, such as native plants; rare, threatened, and endangered fish, wildlife, and plants; wildlife habitat; woodland; native oak, California bay, and California buckeye trees; open space; wetlands; riparian habitat; creeks; watersheds; and wildlife migratory corridors. As discussed above in Impacts BIO-1, BIO-2, BIO-3, BIO-4, and BIO-5, while implementation of the WVFMP and Identified Treatment Projects would affect these resources, mitigation measures would be implemented to reduce impacts to less than significant. No conflict with the policies protecting these resources would occur; therefore, impacts would be **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

3.6 GEOLOGY AND SOILS

This section evaluates the potential for implementation of the WVFMP to affect geology and soil resources. It describes the regulatory setting and environmental conditions of the Plan Area and evaluates the impacts that could occur to geology and soil resources. This section also examines impacts related to unstable soils, landslide, and erosion.

Comments on the Notice of Preparation related to geology and soil resources requested discussion of the effects of herbicides to topsoil, watersheds, and groundwater (refer to Appendix D for a summary of comments received on the NOP). Impacts related to herbicide use to watersheds and groundwater are addressed in Section 3.9, "Hydrology and Water Quality." The effects of herbicides on topsoil are discussed under Section 3.6.3, "Issues Not Evaluated Further," below. Comments also requested discussion related to landslides and erosion of treated areas. Impacts related to landslides and erosion are addressed in Section 3.6.3, "Impact Analysis and Mitigation Measures," below.

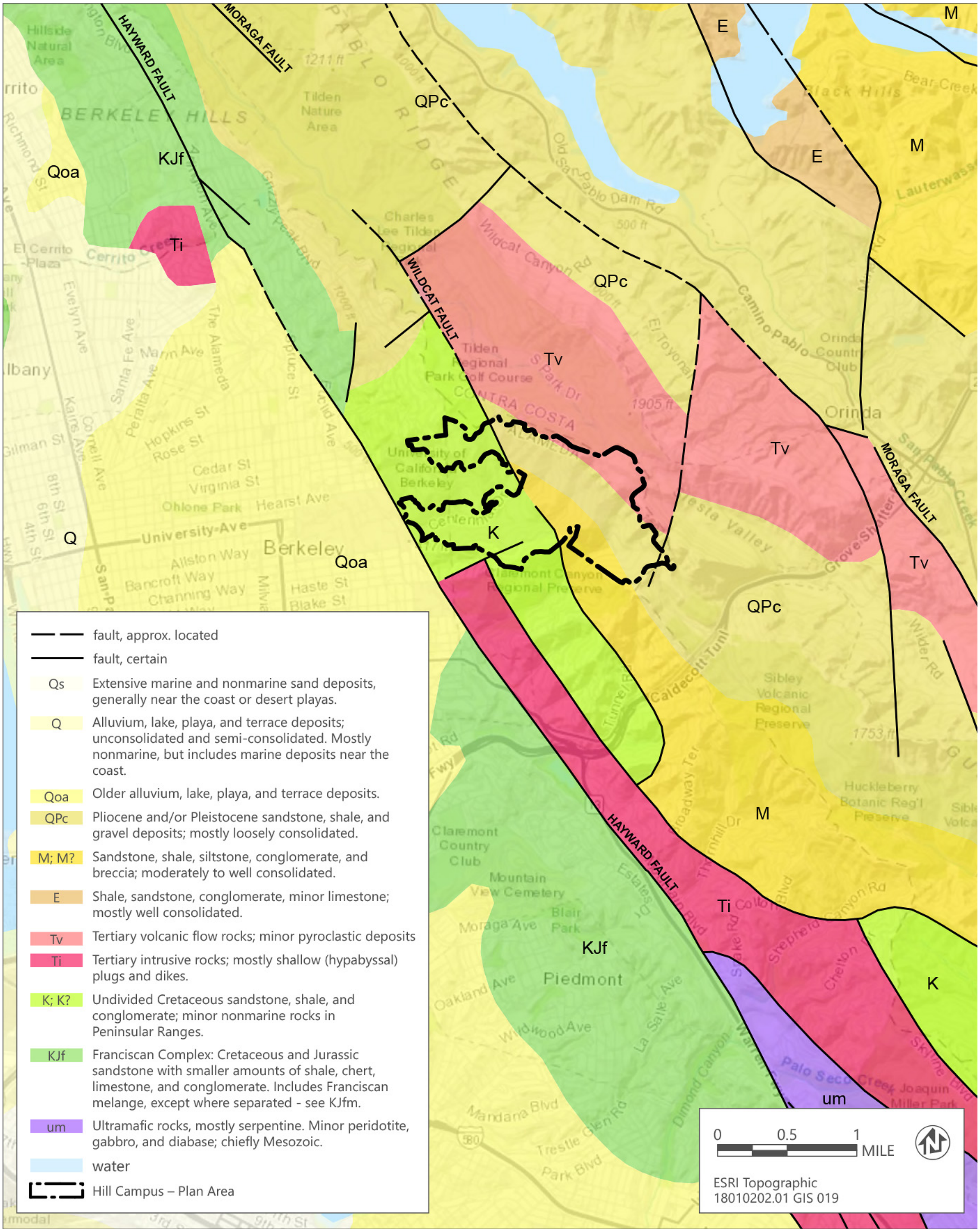
3.6.1 Environmental Setting

OVERALL WVFMP GEOLOGY

The environmental setting is described in terms of the Plan Area's tectonic setting, topography, soils, and geologic and soil hazards. The UC Berkeley Hill Campus is located on the East Bay of the San Francisco Bay Region within the Coast Range geomorphic province. The Plan Area is located at the intersection of two tectonic plates, the Pacific and the North American Plates. The Pacific Plate is sliding north-northwest relative to the North American Plate. The Plan Area is located in the San Andreas and Hayward fault zones, one of the most seismically active areas of the U.S. (Alameda County 2014). The Hayward Fault actually underlies the UC Berkeley Campus and is thought to be capable of generating a magnitude 7.5 earthquake (Berkeley Seismological Laboratory 2017). The Hayward Fault is located just west of the Plan Area trending (Northwest-Southeast) and the Wildcat Canyon Fault bisects the Plan Area further east trending the same direction. The Strawberry Canyon Fault trends perpendicular to the previously mentioned faults within the Plan Area (CGS 2010). The Plan Area is located in the Berkeley Hills which consists of various bedrock units of differing ages. Bedrock in the Plan Area includes Tertiary volcanic flow rocks and minor pyroclastic deposits; Cretaceous sandstone, shale, and conglomerate; Miocene moderately to well consolidated sandstone, shale, siltstone, conglomerate, breccia; and Pliocene and/or Pleistocene mostly loosely consolidated sandstone, shale, and gravel deposits (Figure 3.6-1).

TOPOGRAPHY

Topography is strongly controlled by an area's tectonic setting (Harden 1997). Due to the location of the Plan Area at the intersection of two tectonic plates, the topography of the UC Berkeley Hill Campus is steep, averaging more than 30 percent slope (UC Berkeley 2020a). The Plan Area ranges from 400 feet above sea level at its western edge to 1,800 feet above sea level at its eastern edge (UC Berkeley 2020a). More than 75 percent of the Plan Area has a slope greater than 40 percent, and more than 90 percent has a slope greater than 20 percent. Areas with slopes less than 20 percent are scattered throughout the Plan Area, often in locations not served by either roads or utilities (UC Berkeley 2020a). Topography has an important influence on geomorphic processes because of its effect on slope, which controls the hydraulic gradient of water flow, the energy of erosive runoff, as well as the driving forces for landsliding (Istanbulluoglu and Bras 2005).



Source: data downloaded from University of California, Berkeley in 2019 and CA Dept. of Conservation in 2017

Figure 3.6-1 Geologic Rock Types

SOILS

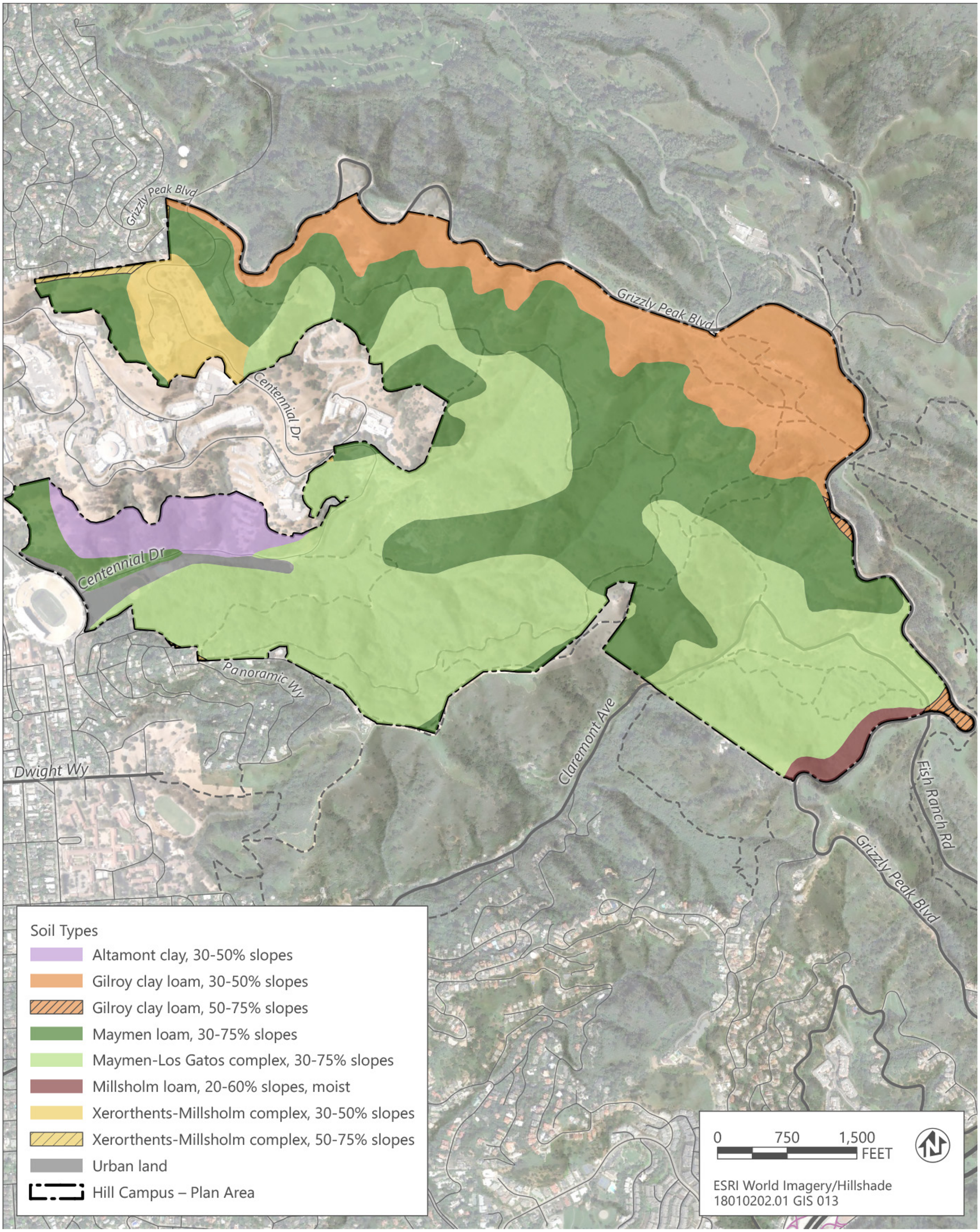
Soil refers to the unconsolidated, thin, variable layer of mineral and organic material, usually biologically active, that covers most of the earth's land surface (Singer and Munns 1999). Soils have structural and biological properties that distinguish them from the rocks and sediment from which they normally originate (Singer and Munns 1999). The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) uses the USDA soil taxonomy system for the classification of soils. This classification is based on chemical, biological, and physical characteristics of soils, including soil color, texture, structure, mineralogy, salt content, and depth. Soils within the Plan Area are shown in Figure 3.6-2 and described in Table 3.6-1.

Table 3.6-1 Description of Soils in the Plan Area

NRCS Mapped Soil Type	Parent Material	Description	Area of Soil within Plan Area (acres)	Soil Erosivity (K Factor*)
Altamont clay, 30-50 percent slopes	Residuum weathered from sandstone and shale	The Altamont series consists of deep, well drained soils that formed in material weathered from fine-grained sandstone and shale. These soils are on gently sloping to very steep uplands (Soil Survey Staff 2009).	28.3	.24
Gilroy clay loam, 30-50 percent slopes	Alluvium derived from greenstone	The Gilroy series consists of moderately deep, well drained soils that formed in material weathered from basic igneous and metamorphic rocks. Gilroy soils are on uplands and have slopes of 9 to 75 percent (Soil Survey Staff 2003a).	101.9	.20
Gilroy clay loam, 50-75 percent slopes	Residuum weathered from greenstone	Same as above.	2.6	.20
Maymen loam, 30-75 percent slopes	Residuum weathered from sedimentary rock	Maymen loam covers about one-third of the steep upland slopes on the Hill Campus. It is a shallow acidic soil (10 to 20 inches deep over shale) in which runoff is rapid to very rapid and the risk of erosion is high to very high (UC Berkeley 2020b).	257.7	.37
Maymen-Los Gatos complex, 30-75 percent slopes, low precipitation	Residuum weathered from sedimentary rock	The Maymen-Los Gatos complex covers about one-quarter of the steep upland slopes. These loamy soils are shallow to moderately deep (10 to 40 inches over shale and sandstone) and some are highly acidic. Runoff and erosion hazards are identified with the Maymen loam (UC Berkeley 2020b).	337.4	.37
Millsholm loam, 20-60 percent slopes, moist	Loamy residuum weathered from sandstone and shale	The Millsholm series consists of shallow, well drained soils that formed in material weathered from sandstone, mudstone and shale. Millsholm soils are on hills and mountains and have slopes of 5 to 75 percent (Soil Survey Staff 2003b).	6.8	.32
Urban land	--	--	9.8	--
Xerorthents-Millsholm complex, 30-50 percent slopes	Residuum weathered from sandstone and shale	The Xerorthent-Millsholm complex covers about one-fifth of steep upland slopes. Soil depths vary from shallow to moderately deep. They are moderately acidic to slightly alkaline loams, clays and silty clay loams, developed on sandstone, siltstone or alluvium, and have runoff and erosion characteristics identical with the Maymen loam (UC Berkeley 2020b).	24.9	.28
Xerorthents-Millsholm complex, 50-75 percent slopes	Residuum weathered from sandstone and shale	See above.	1.7	No rating

Sources: NRCS and UC Berkeley

*K factor is an index which quantifies the relative susceptibility of the soil to sheet and rill erosion. Values range from 0.02 for the least erodible soils to 0.64 for the most erodible.



Source: data downloaded from University of California, Berkeley in 2019 and NRCS in 2020

Figure 3.6-2 Soil Types

GEOLOGIC AND SOIL HAZARDS

Landslides

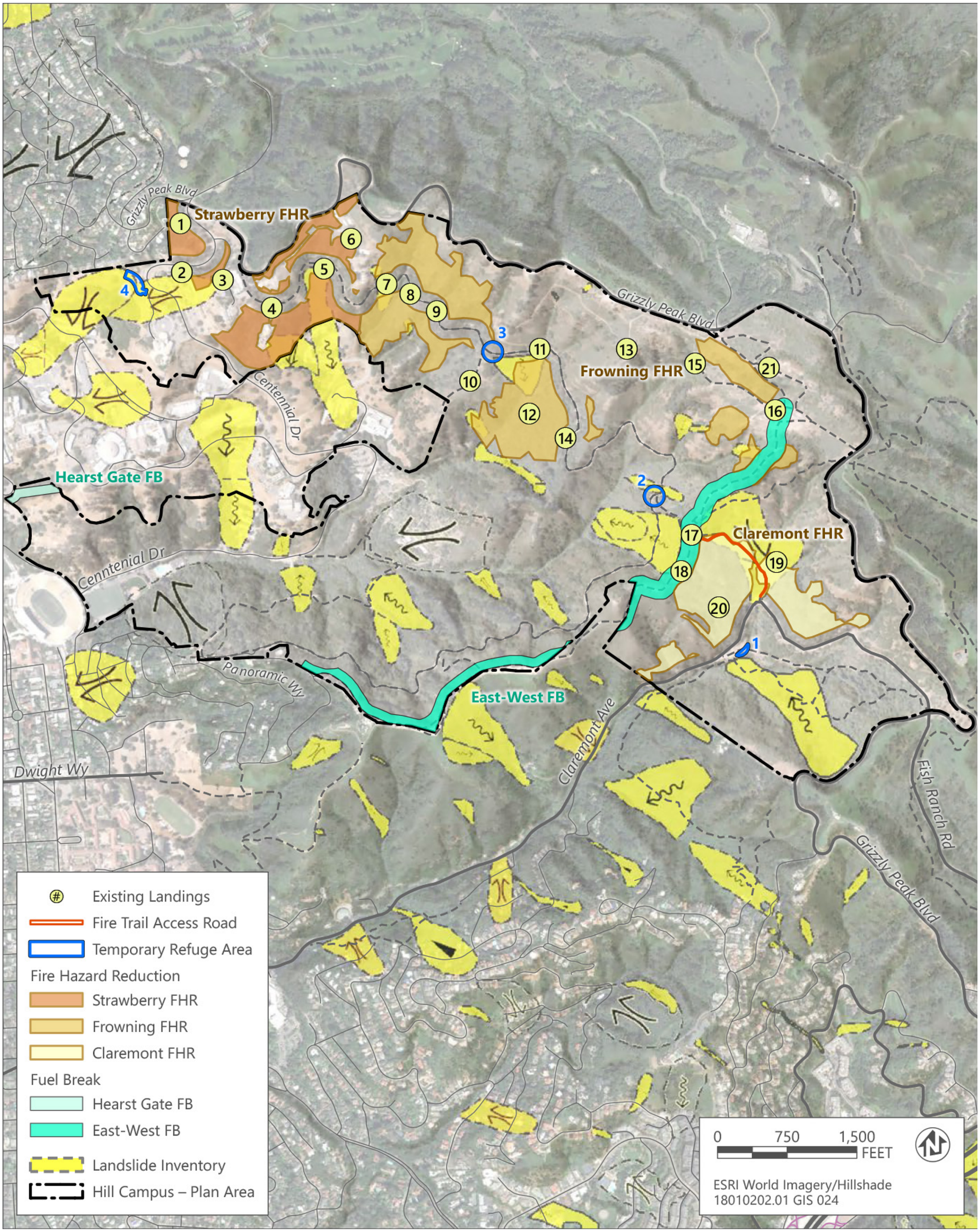
Landslides consist of the downslope movement of soil and rock under the influence of gravity. Landslides occur when the shear stress exceeds the shear strength of the materials forming the slope (Highland and Bobrowsky 2008). Factors contributing to high shear stress on hillslopes include steep slopes, high mass loading through high soil moisture levels or placement of fill material, slope undercutting through erosion or excavation, and soils that vary in volume (shrink and swell) in relation to moisture content (Highland and Bobrowsky 2008). Factors contributing to low shear strength of hillslope materials include bedding planes that dip in the same direction as the slope at the same or a lesser degree of steepness, high water pressure in soil pores, presence of faults or joints, and weak materials (e.g., soft soils or rock, unconsolidated materials, fine grain size) (Highland and Bobrowsky 2008). Climate and vegetation also affect landslide hazard because of their influence on soil root support, which resists landsliding, and hillslope moisture, which drives landsliding (Istanbulluoglu and Bras 2005). Removal of vegetation during fuel management activities also removes root systems that stabilize slopes through the physical removal of the roots or indirect removal of roots due to the eventual decay of the root system. Herbicides applied to vegetation can also cause the eventual decay of root systems, which can contribute to an increased risk of landslide if a broadcast herbicide application occurs across a large area susceptible to landslides.

Landslides can be broken into two categories; shallow-seated and deep-seated landslides. Shallow-seated landslides occur in the unconsolidated earth material and soil overlying bedrock. Deep-seated landslides occur below the regolith and includes failure into bedrock. Shallow landslides typically occur in steep areas with slopes greater than 65 percent (CGS 2013). Deep-seated landslides are primarily a function of rock strength and slope, but are also affected by precipitation and earthquake potential (CGS 2013). The best indicator of high landslide potential is evidence of previous landsliding (Highland and Bobrowsky 2008). Many historic landslides have been mapped by California Geological Survey (CGS) in the Plan Area (CGS 2020a). Additionally, CGS has mapped deep-seated landslide susceptibility in the Plan Area (Figure 3.6-4). Much of the Plan Area is mapped as having very high landslide susceptibility (i.e. VIII, IX, and X) (Willis et. al. 2011, CGS 2020b).

Wildfire and Landslide Risk

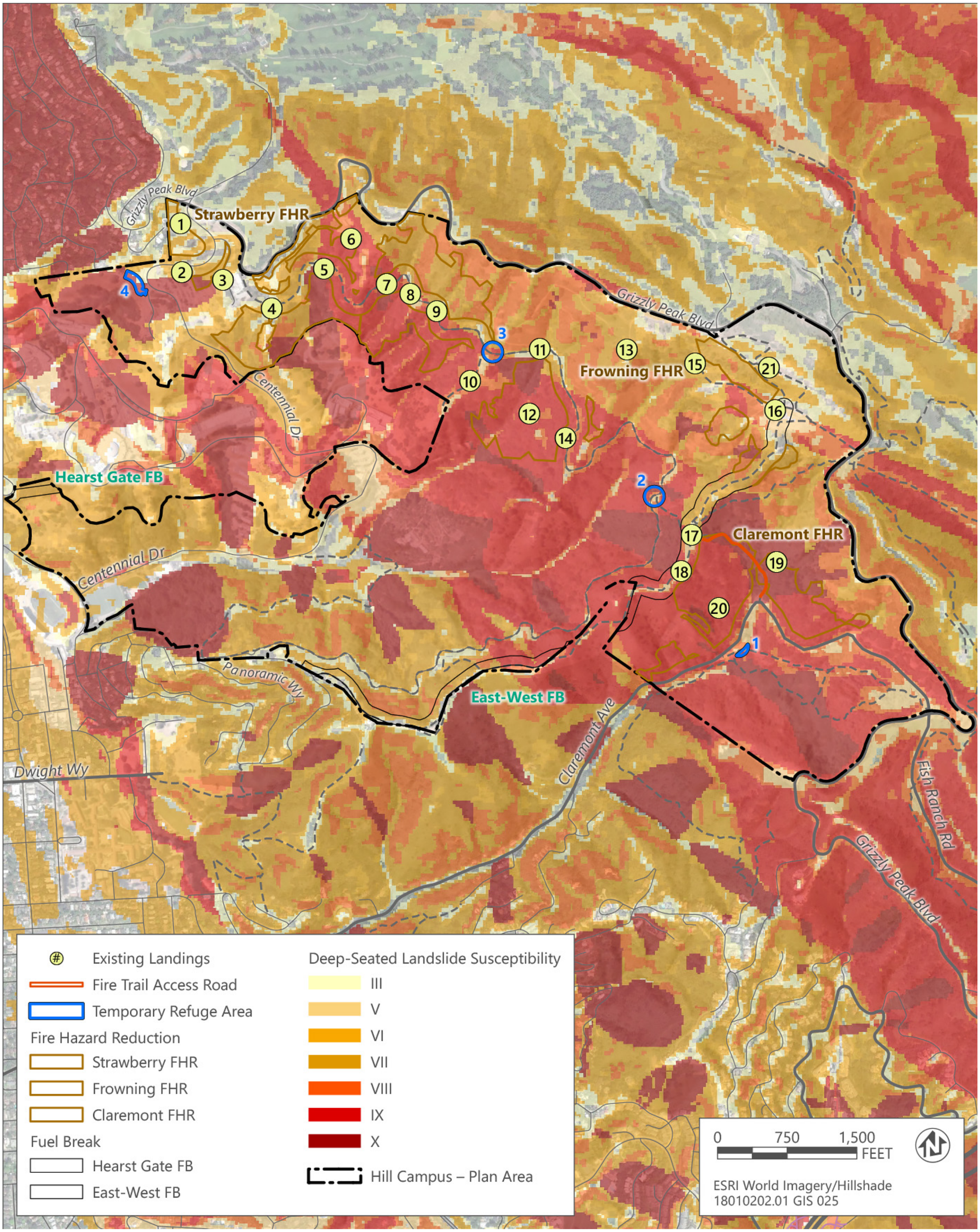
Moderate to high severity wildfire can greatly increase the likelihood of landslide (Haas et al 2017). Wildfire can significantly alter the hydrologic response of a watershed to the extent that even small rainstorms can produce dangerous flash floods and debris flows. In existing models, the primary variable connecting a wildfire and a subsequent landslide is the amount of a watershed that burns with moderate to high severity (Haas et al. 2017). Moderate to high-severity fires can cause a loss of soil hydrologic function by sealing pores and degrading soil structure; it can cause a loss of soil productivity by processes of erosion, mass-wasting, and nutrient volatization; and allow exotic plants to establish which can affect soil productivity. Sediment yield following a wildfire commonly exceed background erosion rates in mountainous terrain like the Plan Area (DiBiase and Lamb 2019). In landscapes where slopes are steeper than the angle of repose, sediment is transported dry from hillslopes to channels immediately following a wildfire by rolling and bouncing downslope by gravity alone (DiBiase and Lamb 2019). This sediment loading of channels leads to debris-flows and additional scour of channel deposits during subsequent storms (DiBiase and Lamb 2019).

Fires that burn with low severity, such as the prescribed burning proposed in the WVFMP, can maintain soil cover, mineralize important nutrients from plant matter stored on the soil surface, reduce fuel loads leading to possible future high burn severity, and stimulate herbaceous vegetation helping to facilitate nutrient cycling.



Source: data downloaded from University of California, Berkeley in 2019 and data from CGS in 2020

Figure 3.6-3 Landslide Inventory



Source: data downloaded from University of California, Berkeley in 2019 and data from CGS in 2020

Figure 3.6-4 Deep-Seated Landslide Susceptibility

Soil Erosion

Soil erosion is caused by the detachment and entrainment of soil particles through the action of water and wind and can be classified into four general types: rain splash, sheet, rill, and gully erosion. Rain splash erosion causes detachment of soil from the impact of the rain drop. Sheet erosion is the removal of soil of a generally uniform depth across a slope and is caused by non-concentrated runoff. Rill erosion refers to the removal of soil in shallow (i.e., less than approximately 6 inches deep), usually parallel, channels from a slope and is caused by concentrated runoff. Gully erosion consists of removal of soil from deeper channels and is also caused by concentrated runoff. Although usually less conspicuous than rill and gully erosion, sheet erosion tends to result in more soil loss over a wide area. Soils most susceptible to erosion are those high in coarse silt- and fine sand-sized particles (Balasubramanian 2017), particularly when organic matter content is low and soil structure is weak. The likelihood of erosion is greater when the vegetative cover is removed or the soil is otherwise disturbed. Soil erosion by water is more common on steep slopes than on shallow slopes (e.g., 10 percent gradient or less), because at lower slope gradients surface runoff cannot reach velocities necessary to erode the soil. In general, areas with less vegetative cover are more prone to soil erosion than heavily vegetated areas, because surface cover and additional soil structure from plant roots can reduce soil erosion potential. Wind can also cause soil erosion in areas with a combination of high winds and exposed soil. The erosion rate of a particular soil in the absence of human activities is referred to as the natural erosion rate. Soil erosion in excess of the natural erosion rate is called accelerated soil erosion and is usually caused by human activities such as grazing, timber harvesting, poor road construction practices, grading, and other land-disturbing activities.

Erodibility by water is calculated using the K factor, an index which quantifies the relative susceptibility of the soil to sheet and rill erosion. K factor values range from 0.02 for the least erodible soils to 0.64 for the most erodible. Soil properties affecting the K factor include texture, organic matter content, structure, and saturated hydraulic conductivity (NRCS 2019). Table 3.6-1 includes the K factors for the soils within the Plan Area which range from 0.20 to 0.37. The soils with the highest erodibility in the Plan Area are the Maymen soil series.

Wildfire and Erosion Risk

Sediment yields following a wildfire commonly exceed natural erosion rates in mountainous terrain like the Plan Area (DiBiase and Lamb 2019). Surface erosion from high severity wildfire can increase runoff and erosion rates by two or more orders of magnitude relative to unburned conditions (Robichaud et al. 2010). Fires that burn with low severity, such as the prescribed burning proposed in the WVFMP, can maintain soil cover, reduce fuel loads leading to possible future high burn severity, which helps prevent substantial soil erosion in the event of a wildfire.

IDENTIFIED TREATMENT PROJECTS

Strawberry Fire Hazard Reduction Project

Mechanical and herbicide (cut stump or basal bark application) vegetation treatment activities on 23.7 acres are proposed for the Strawberry Fire Hazard Reduction Project in Strawberry Canyon near upper Centennial Drive and Upper Jordan Fire Trail. This treatment would use three existing unpaved access roads and 6 landings which would require minor grading. Table 3.6-2 describes the soils in this project area.

Table 3.6-2 Soils in the Strawberry Fire Hazard Reduction Project

Soil Type	Acres in Project Area (percent of project area)	K factor
Gilroy clay loam, 30-50 percent slopes	4 (16.9)	.20
Maymen loam, 30-75 percent slopes	9 (38.1)	.37
Maymen-Los Gatos complex, 30-75 percent slopes	8.1 (34.2)	.37
Xerorthents-Millsholm complex, 30-50 percent slopes	1.7 (7.1)	.28
Xerorthents-Millsholm complex, 50-75 percent slopes	0.05 (0.2)	not rated

Source: NRCS 2020

The Strawberry Fire Hazard Reduction Project partially overlaps a dormant earthflow 10 to 50 feet deep (CGS 2020a) (Figure 3.6-3). Approximately 4.1 acres of this project area overlaps with existing mapped landslides (CGS 2020a). A portion of the eastern project area is mapped as the highest susceptibility for deep-seated landslide (Willis et. al. 2011, CGS 2020b) (Figure 3.6-4).

Frowning Fire Hazard Reduction Project

Manual, mechanical, and herbicide (cut stump or basal bark application) vegetation treatment activities on 49.2 acres are proposed for the Frowning Fire Hazard Reduction Project along Frowning Ridge near the Upper Jordan Fire Trail. Eleven landings require minor regrading in this project area. Table 3.6-3 describes the soils in this project area.

Table 3.6-3 Soils in the Frowning Fire Hazard Reduction Project

Soil Type	Acres in Project Area (percent of project area)	K factor
Gilroy clay loam, 30-50 percent slopes	12.6 (25.5)	.20
Maymen loam, 30-75 percent slopes	15.2 (31.9)	.37
Maymen-Los Gatos complex, 30-75 percent slopes	21.5 (43.7)	.37

Source: NRCS 2020

The Frowning Fire Hazard Reduction Project partially overlaps a dormant earthflow of 10 to 50 feet depth (CGS 2020a) (Figure 3.6-3). Approximately 3.3 acres of this project area overlaps historic landslides (CGS 2020a). The southern portion of the project area is mapped as the highest susceptibility for deep-seated landslide (Willis et. al. 2011, CGS 2020b) (Figure 3.6-4).

Claremont Fire Hazard Reduction Project

Mechanical and herbicide (cut stump or basal bark application) vegetation treatment activities on 25.5 acres are proposed for the Claremont Fire Hazard Reduction Project in the areas of Claremont Canyon north of Claremont Avenue. The Fire Trail Access Road and four existing landings would require minor grading in this project area. Table 3.6-4 describes the soils in this project area.

Table 3.6-4 Soils in the Claremont Fire Hazard Reduction Project

Soil Type	Acres in Project Area (percent of project area)	K factor
Maymen loam, 30-75 percent slopes	4.1 (16)	.37
Maymen-Los Gatos complex, 30-75 percent slopes	21.4 (84)	.37

Source: NRCS 2020

The Claremont Fire Hazard Reduction Project overlaps several historic landslides mapped by CGS (CGS 2020a) (Figure 3.6-3). Approximately 3.4 acres of this project area overlaps a historic landslide (CGS 2020a). All of this project area is mapped as having the highest susceptibility for deep-seated landslide (Willis et. al. 2011, CGS 2020b) (Figure 3.6-4).

Hearst Gate Fuel Break

Manual and herbicide vegetation treatment activities on 1.2 acres (0.1-mile-long and 93 feet wide) are proposed for the Hearst Gate Shaded Fuel Break Project located between the Hill Campus boundary and the Hearst Gate to LBNL. No grading to reestablish landings is proposed for this project. Table 3.6-5 describes the soils in this project area.

Table 3.6-5 Soils in the Hearst Gate Fuel Break Project

Soil Type	Acres in Project Area (percent of project area)	K factor
Altamont clay, 30-50 percent slopes	0.19 (15.8)	.24
Maymen loam, 30-75 percent slopes	1.03 (85.8)	.37

Source: NRCS 2020

The Hearst Gate Fuel Break Project does not overlap historic landslides mapped by CGS (CGS 2020a) (Figure 3.6-3). All of this project area is mapped as having moderate susceptibility to deep-seated landslide (Willis et. al. 2011, CGS 2020b) (Figure 3.6-4).

East-West Fuel Break

Manual, mechanical, and herbicide vegetation treatment activities on 22 acres (1.4 miles long and 126 feet wide) are proposed for the East-West Unshaded Fuel Break on Claremont Ridge along the Hill Campus boundary and Claremont Canyon Regional Preserve. Table 3.6-6 describes the soils in the project area.

Table 3.6-6 Soils in the East-West Fuel Break Project

Soil Type	Acres in Project Area (percent of project area)	K factor
Gilroy clay loam, 30-50 percent slopes	4.06 (18.5)	.20
Maymen loam, 30-75 percent slopes	8.0 (36.4)	.37
Maymen-Los Gatos complex, 30-75 percent slopes	9.95 (45)	.37

Source: NRCS 2020

The East-West Fuel Break Project is located along a ridge which is not as susceptible to landslide as sloped areas and only overlaps 0.55 acres of mapped historic landslides (CGS 2020a) (Figure 3.6-3). Only the central portion of the proposed fuel break is mapped as having highest susceptibility for deep-seated landslide (Willis et. al. 2011, CGS 2020b) (Figure 3.6-4).

Temporary Refuge Area 1

Manual, mechanical, and herbicide vegetation treatment activities on 0.1 acres are proposed for Temporary Refuge Area (TRA) 1 on the southeast side of Claremont Avenue at Signpost 29. All trees and shrubs would be removed in a circular area from the edge of pavement or fire trail to create a temporary refuge for firefighters and evacuees. Mowed, low-profile grass may remain within the temporary refuge areas. The soil type in this area is Maymen-Los Gatos complex, 30-75 percent slopes. TRA 1 is not proposed on a steep slope and there are no CGS mapped previous landslides in the area (CGS 2020a).

Temporary Refuge Area 2

Manual, mechanical, and herbicide vegetation treatment activities on 0.72 acres are proposed for TRA 2 along the Upper Jordan Fire Trail at Signpost 32. As with TRA 1, all trees and shrubs would be removed in a circular area from the edge of pavement or fire trail to create a temporary refuge for firefighters and evacuees. Mowed, low-profile grass may remain within the temporary refuge areas. Soils in TRA 2 include 0.6 acres of Maymen loam, 30-75 percent slopes and 0.12 acres of Maymen-Los Gatos complex, 30-75 percent slopes. TRA 2 is not proposed on a steep slope but does overlap with 0.16 acres of a historic landslide (CGS 2020a).

Temporary Refuge Area 3

Manual, mechanical, and herbicide vegetation treatment activities on 0.72 acres are proposed for TRA 3 south of and adjacent to the Upper Jordan Fire Trail. As with the other TRAs, all trees and shrubs would be removed in a circular area from the edge of pavement or fire trail to create a temporary refuge for firefighters and evacuees. Mowed, low-profile grass may remain within the temporary refuge areas. Soils in TRA 3 include 0.52 acres of Maymen loam, 30-75 percent slopes and 0.2 acres Maymen-Los Gatos complex, 30-75 percent slopes. TRA 3 is not proposed on a steep slope but does overlap with 0.01 acres of a historic landslide (CGS 2020a).

Temporary Refuge Area 4

TRA 4 is proposed entirely within the existing paved Lawrence Hall of Science Parking Lot, therefore no ground disturbance would occur. TRA 4 is not proposed on a steep slope but does overlap with 0.27 acres of a historic landslide (CGS 2020a).

3.6.2 Regulatory Setting

The regulations identified below are applicable at the program and project level, unless otherwise noted.

FEDERAL

Earthquake Hazards Reduction Act (Public Law 95-124, 42 U.S.C. 7701 et. Seq)

The purpose of this Act to reduce the risks of life and property from future earthquakes in the U.S. through the establishment and maintenance of an effective earthquake hazards reduction program. The objectives of the program include: (1) the education of the public; (2) the development of technologically and economically feasible design and construction methods and procedures; (3) the implementation of a system for predicting damaging earthquakes and for identifying seismic hazards; (4) the development of model building codes; (5) the development of methods of mitigating the risks from earthquakes; (6) the increased use of existing scientific and engineering knowledge to mitigate earthquake hazards; and (7) the development of ways to assure the availability of affordable earthquake insurance.

Clean Water Act (33 USC Section 1251 Et Seq.)

The Federal Water Pollution Control Act of 1948 was the first major U.S. law to address water pollution. Growing public awareness and concern for controlling water pollution led to sweeping amendments in 1972. As amended in 1972, the law became commonly known as the Clean Water Act (CWA). The CWA serves as the primary federal law protecting the quality of the nation's surface waters, including wetlands. The CWA provides standard regulations for the discharge of pollutants to the waters of the U.S. to maintain their chemical, physical, and biological integrity and protect their beneficial uses. In addition, the CWA provides the statutory basis for the National Pollutant Discharge Elimination System (NPDES). The CWA requires states to adopt water quality standards that must be approved by the U.S. Environmental Protection Agency (EPA) and requires NPDES permits for the discharge of pollutants in U.S. waters. In addition, the CWA gives authority to the EPA to (1) implement pollution control programs, including setting waste water standards and effluent limits on an industry-wide basis; and (2) authorize the NPDES Permit Program permitting, administration, and enforcement to state governments with oversight by the EPA.

Federal Antidegradation Policy (Code of Federal Regulations – Title 40: Protection of Environment 40 CFR 131.12)

The Federal Antidegradation Policy was issued in 1968 by the U.S. Department of the Interior to (1) ensure that activities will not lower the water quality of existing use, and (2) restore and maintain "high quality water." The federal policy maintains that states shall adopt a statewide antidegradation policy that includes the following conditions:

- Existing instream water uses and a level of water quality necessary to maintain those uses shall be maintained and protected.
- Water quality will be maintained and protected in waters that exceed water quality levels necessary for supporting fish, wildlife, and recreational activities, and water quality, unless the state deems that water quality levels can be lowered to accommodate important economic or social development. In these cases, water quality levels can only be lowered to levels that support all existing uses.

Where high quality waters constitute an outstanding National resource, such as waters of national and state parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.

STATE

Porter-Cologne Water Quality Act (Cal. Water Code Div. 7)

The Porter-Cologne Water Quality Act is a key element of California water quality control legislation. Under the act, the State Water Resources Control Board (SWRCB) is given authority over state water rights and water quality policy and it established the state's nine regional water quality control boards (RWQCBs) to regulate and oversee regional and local water quality issues. The RWQCB is also responsible for developing and updating Basin Plans targeted toward (1) protecting waters designated with beneficial uses, (2) establishing water quality objectives for surface water and groundwater, and (3) determining actions necessary to maintain water quality standards and control point- and nonpoint-sources of pollution into the state's waters. Under the Act, proposed waste dischargers such as UC Berkeley are required to file Reports of Waste Discharge to the RWQCB and the SWRCB and RWQCB are granted jurisdiction over the issuance and enforcement of Waste Discharge Requirements, NPDES permits, and Section 401 water quality certifications.

California Geological Survey

The California Geological Survey's Forest and Watershed Geology Program provides technical information and advice about landslides, slope stability, erosion, sedimentation, and other geological hazards across the state's watershed and parkland areas. UC Berkeley and other entities use these data to evaluate soil conditions and geologic hazards. The California Geological Survey Forest and Watershed Geology Program performs vital geological reviews of Timber Harvesting Plans under AB1492, along with CAL FIRE, the Department of Fish and Wildlife, and the Regional Water Quality Control Boards.

California State Antidegradation Policy (SWRCB Resolution No. 68-16, "Policy with Respect to Maintaining higher quality waters in California")

In 1968, the state of California adopted an antidegradation policy in response to directives under the Federal Antidegradation Policy. The antidegradation policy applies to high quality waters of the state, including surface waters and groundwater, and all existing and potential uses. The policy requires that high quality waters be maintained to the maximum extent possible and any proposed activities that can adversely affect high quality surface water and groundwater must (1) be consistent with the maximum benefit to the people of the state, (2) not unreasonably affect present and anticipated beneficial use of the water, and (3) not result in water quality less than that prescribed in water quality plans and policies.

Z'berg-Nejedly Forest Practice Act

Although the WVFMP excludes timber removal for commercial purposes, the Z'berg-Nejedly Forest Practice Act (Forest Practice Act) may be pertinent as it relates to identifying operating methods and procedures that seek to protect fish, wildlife, forests, and streams within timber harvesting areas where WVFMP treatments may also be implemented. The Forest Practice Act is intended to achieve "maximum sustained production of high-quality timber products…while giving consideration to values relating to recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment and aesthetic enjoyment" (PRC Section 4513[b]). The regulations created by the Forest Practice Act define factors such as the: size and location of harvest areas, include measures to prevent unreasonable damage to residual trees, and address the protection of riparian areas, water courses and lakes, wildlife, and habitat areas.

LOCAL

As a constitutionally-created state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies. Therefore, relevant regulations are summarized below.

UC Berkeley 2020 LRDP

The UC Berkeley 2020 LRDP contains the following policy related to geology and soil resources that is applicable to the WVFMP (UC Berkeley 2005):

- Manage the Hill Campus landscape to reduce fire and flood risk and restore native vegetation and hydrology patterns.

Alameda County General Plan

The Open Space Element of the Alameda County General Plan contains the following goals and policies related to geology and soil resources that are applicable to the WVFMP (Alameda County 1994a):

- Protect Open Space Areas from Erosion; Restore Eroded Areas

  A. Program to include methods of protecting open space areas from the hazards of erosion should be established and implemented. The program should include such measures as replanting, reforestation, and land sculpturing, to restore eroded areas to original conditions. Where necessary, flood control improvements that are compatible with the natural area should be established.

The Conservation Element of the Alameda County General Plan contains the following goals and policies related to geology and soil resources that are applicable to the WVFMP (Alameda County 1994b):

D. Agriculture and Soils Resource Management

GOAL: To protect and maintain soils in Alameda County in such a manner to be beneficial to all land users.

<u>Objectives:</u>

3. To set up rational guideline to control non-point source pollution.

The Safety Element of the Alameda County General Plan contains the following goals and policies related to geology and soil resources that are applicable to the WVFMP (Alameda County 2014):

GOAL 1: To minimize risks to lives and property due to seismic and geologic hazards.

- **Policy P1:** To the extent possible, projects should be designed to accommodate seismic shaking and should be sited away from areas subject to hazards induced by seismic shaking (landsliding, liquefaction, lurking, etc.) where design measures to mitigate the hazards will be uneconomic or will not achieve a satisfactory degree of risk reduction. (Source: Seismic Safety and Safety Element, pg. 6)
- **Policy P3:** Aspects of all development in hillside areas, including grading, vegetation removal and drainage, should be carefully controlled in order to minimize erosion, disruption to natural slope stability, and landslide hazards. (Source: Seismic Safety and Safety Element, pg. 6)
  - **Action A17:** Aspects of all development in hillside areas, including grading, vegetation removal and drainage, should be carefully controlled in order to minimize erosion, disruption to natural slope stability, and landslide hazards. The County's development standards and guidelines, permit application review process, Section 15.08.240 of its Building Ordinance, the Grading Erosion and Sediment Control Ordinance (Chapter 15.36 of the Alameda County General Ordinance Code), the Stormwater Management and Discharge Control Ordinance (Chapter 13.08), and Subdivision Ordinance (Title 16) shall serve to implement this policy.

Contra Costa County General Plan

The Conservation Element of the Contra Costa County General Plan contains the following goals and policies related to geology and soil resources that are applicable to the WVFMP (Contra Costa County 2005):

<u>Soil Resources</u>

GOAL 8-P: To encourage the conservation of soil resources to protect their long-term productivity and economic value.

GOAL 8-Q: To promote and encourage soil management practices that maintain the productivity of soil resources.

- **Policy 8-63:** The County shall protect soil resources within its boundaries.
- **Policy 8-63:** Erosion control procedures shall be established and enforced for all private and public construction and grading projects.
- **Policy 8-64:** The County shall support and encourage existing local, state, and federal soil conservation and restoration programs within its borders.

- **Policy 8-67:** Lands having a prevailing slope above 26 percent shall require adequate special erosion control and construction techniques.
- **Policy 8-68:** Lands having a high erosion potential as identified in the Soil Survey shall require adequate erosion control methods for agricultural and other uses.

The Safety Element of the Contra Costa County General Plan contains the following goals and policies related to geology and soil resources that are applicable to the WVFMP (Contra Costa County 2005):

Seismic Hazards
GOAL 10-A: To protect human life and reduce the potential for serious injuries from earthquakes; and to reduce the risks of property losses from seismic disturbances which could have severe economic and social consequences for the County as a whole.

GOAL 10-C: To protect persons and property from the life-threatening, structurally and financially disastrous effects of ground rupture and fault creep on active faults, and to reduce structural distress caused by soil and rock weakness due to geologic faults.

GOAL 10-D: To reduce to a practical minimum the potential for life loss, injury, and economic loss due to liquefaction-induced ground failure, levee failure, large lateral land movements toward bodies of water, and consequent flooding; and to mitigate the lesser consequences of liquefaction.

- **Policy 10-4:** In areas prone to severe levels of damage from ground shaking (i.e., Zone IV on Map 10-4), where the risks to life and investments are sufficiently high, geologic-seismic and soils studies shall be required as a precondition for authorizing public or private construction.

Ground Failure and Landslide Hazards
GOAL 10-E: To minimize the risk of loss of life or injury due to landslides, both ordinary and seismically-induced.

Ground Failure and Landslide Hazards
GOAL 10-F: To reduce economic losses and social disruption from landslides, both ordinary and seismically-induced.

- **Policy 10-24:** Proposed extensions of urban or suburban land uses into areas characterized by slopes over 15 percent and/or generally unstable land shall be evaluated with regard to the safety hazard prior to the issuance of any discretionary approvals. Development on very steep open hillsides and significant ridgelines throughout the County shall be restricted, and hillsides with a grade of 26 percent or greater shall be protected through implementing zoning measures and other appropriate actions.
- **Policy 10-29:** Significant very steep hillsides shall be considered unsuitable for types of development which require extensive grading or other land disturbance.

City of Berkeley General Plan

The Disaster Preparedness Safety Element of the City of Berkeley General Plan contains the following goals and policies related to geology and soil resources that are applicable to the WVFMP (Contra Costa County 2005):

Element Objectives
4. Reduce the potential for loss of life, injury, and economic damage resulting from earthquakes and associated hazards.

- **Policy S-13 Hazards Identification:** Identify, avoid and minimize natural and human-caused hazards in the development of property and the regulation of land use.

Actions:
A. Maintain and make publicly available up-to-date hazard maps identifying areas subject to heightened risk from potential seismic hazards (including fault rupture, ground failure, ground shaking, and liquefaction), and fire, flood, landslide, and other hazards, such as toxic contamination and radioactive release.

B. Improve the understanding of identified hazards and mitigation needs via area-specific studies such as microzonation studies.

City of Oakland General Plan

The Open Space, Conservation, and Recreation Element of the City of Oakland General Plan contains the following goals and policies related to geology and soil resources that are applicable to the WVFMP (Oakland 1996):

GOAL CO-1: Natural Resources that are conserved and prudently used to sustain life, support urban activities, protect public health and safety, and provide a source of beauty and enjoyment.

Objective CO-1: Soil Conservation

To protect and preserve soil as a resource for health plant, animal, and human life.

- Policy CO-1.1: Soil loss in new development: Regulate development in a manner which protects soil from degradation and misuse or other activities which significantly reduce its ability to support plant and animal life. Design all construction to ensure that soil is well secured so that unnecessary erosion, siltation of streams, and sedimentation of water bodies does not occur.

Objective CO-2: Land Stability To minimize safety hazards, environmental impacts, and aesthetic impacts associated with development on hillsides and in seismic high-risk areas

- Policy CO-2.1: Encourage development of practices which minimize the risk of landsliding. Encourage development practices which minimize the risk of landsliding.
- Policy CO-2.2: Unstable geologic features

Retain geologic features known to be unstable, including serpentine rock, areas of known landsliding, and fault lines, as open space.

The Safety Element of the City of Oakland General Plan contains the following goals and policies related to geology and soil resources that are applicable to the WVFMP (Oakland 2004):

- Policy GE-1: Develop and continue to enforce and carry out regulations and programs to reduce seismic hazards and hazards from seismically triggered phenomena.
  - Action GE-1.2: Enact regulations requiring the preparation of site-specific geologic or geotechnical reports for development proposals in areas subject to earthquake-induced liquefaction, settlement or severe ground shaking, and conditioning project approval on the incorporation of necessary mitigation measures.
- Policy GE-2: Continue to enforce ordinances and implement programs that seek specifically to reduce the landslide and erosion hazards.
  - Action GE-2.2: Continue to enforce the grading, erosion and sedimentation ordinance by requiring, under certain conditions, grading permits and plans to control erosion and sedimentation.
  - Action GE-2.3: Continue to enforce provisions under the creek protection, storm water management and discharge control ordinance designed to control erosion and sedimentation.
  - Action GE-2.6: Design fire-preventive vegetation-management techniques and practices for creeksides and high-slope areas that do not contribute to the landslide and erosion hazard.

3.6.3 Impact Analysis and Mitigation Measures

ANALYSIS METHODOLOGY

The analysis of environmental impacts on geology and soil resources focuses on the changes to the existing or baseline geologic and soil conditions in the context of the thresholds of significance listed below. Impacts are assessed by evaluating potential impacts from unstable geology and soils, earthquakes, and landslides associated with the implementation of the WVFMP. Significance determinations account for the influence of relevant EPMs, which are incorporated into treatment design; the full text of EPMs is presented in Section 2.6 "Environmental Protection Measures."

SIGNIFICANCE CRITERIA

A geology and soils impact is considered significant if implementation of the WVFMP would:

- directly or indirectly cause potential substantial adverse impacts, including the risk of loss, injury, or death involving the rupture of a known earthquake fault, strong seismic shaking, seismic-related ground failure, soil liquefaction, or landslides;
- result in substantial soil erosion or the loss of topsoil;
- locate project facilities on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
- locate project facilities on expansive soil, creating substantial risks to property;
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water;
- directly or indirectly destroy a unique paleontological resource or site or unique geologic feature;
- result in the loss of availability of a known mineral resource that would be of value; or
- result in the loss of availability of a locally-important mineral resource recovery site.

ISSUES NOT EVALUATED FURTHER

The following issues are not evaluated further in the EIR for the reasons summarized below. Refer to the Initial Study in Appendix C of this EIR for additional explanation.

Seismic or secondary seismic hazards. The proposed Plan does not include excavation, installation of structures, or other subsurface activity that could exacerbate the risk of rupture of a known earthquake fault, seismic ground shaking, or seismic related ground failure. Therefore, implementation of the WVFMP would not directly or indirectly cause substantial adverse effects related to this seismic hazard. No impact would occur, and this issue is not discussed further.

Lateral spreading, subsidence, liquefaction, or collapse due to unstable or expansive soil. Although expansive soils exist within the Plan Area and vegetation removal may increase soil moisture content, Plan implementation would not include the construction of buildings or structures that could be affected by soil expansion, lateral spreading, or collapse. Additionally, vegetation would not be removed in close proximity to existing buildings or structures. Therefore, there is no potential for Plan implementation to exacerbate the risk of lateral spreading, subsidence, liquefaction, or collapse. There would be no impact and this issue is not discussed further.

Soils incapable of supporting septic tanks or alternative waste water disposal. Plan implementation would not involve the installation of any septic system of other form of waste water disposal. There would be no impact and this issue is not discussed further.

Destruction of unique paleontological resource or site or unique geologic feature. The fossil yielding potential of a particular area is highly dependent on the geologic age and origin of the underlying rocks, which vary in distribution and surface exposure throughout the state. All sedimentary rocks, some volcanic rocks, and some metamorphic rocks have potential for the presence of scientifically significant, nonrenewable paleontological resources. Treatment activities implemented under the Plan could result in the removal of existing subsurface materials during grading and vegetation removal. However, Plan implementation would not include excavation beyond the potential disturbance of the top inches of soil during minor grading activities and mechanical treatments. Therefore, the potential to disturb paleontological or unique geologic features is low. Accordingly, Plan implantation would not be expected to directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. This impact would be less than significant, and this issue is not discussed further.

In addition, comments provided on the NOP raised the issue of herbicide effects on topsoil. Herbicide application can alter soil function (Rose et. al. 2016). Herbicides can disrupt earthworm ecology in soils exposed to glyphosate; inhibit soil nitrogen cycling by sulfonylurea herbicides in alkaline or low organic matter soils; and increase site-specific disease resulting from the application of a variety of herbicides (Rose et. al. 2016). Herbicide application under the WVFMP would only occur using targeted application to stumps, resprouts, and foliage, which would not impact large areas of topsoil. This impact would be less than significant, and this issue is not discussed further. Impacts related to herbicide use are discussed further in Section 3.8, "Hazards and Hazardous Materials" and Section 3.9, "Hydrology and Water Quality."

IMPACT ANALYSIS

Impact GEO-1: Result in Substantial Erosion or Loss of Topsoil

Vegetation treatment activities implemented under the WVFMP may involve the disturbance of soils and the reduction of vegetative cover, which has the potential to substantially increase rates of erosion and loss of topsoil. Mechanical treatments using heavy machinery are the most likely activity to cause soil disturbance which could lead to substantial erosion or loss of topsoil especially in areas of steep slopes. Minor grading of existing landing sites and access roads could also result in erosion as well as dust. Prescribed burning can increase risk of water repellency (Robichaud et al. 2010) and breakdown of soil structure, which can lead to significant increases in erosion. Managed herbivory can also accelerate erosion through creation of trails and exposed soils. The WVFMP would reduce the amount of vegetation in all treated areas, which has the potential to expose soil to wind and water erosion. Implementation of EPMs AQ-2, BIO-7, GEO-1 through GEO-5, and HYD-1 would avoid and minimize the risk of substantial erosion and loss of topsoil. This impact would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects**.**

Overall WVFMP

The effects of vegetation treatment activities on erosion and sediment yields depend on techniques used, site characteristics, storm events following treatments, and skills of the equipment operators (Robichaud et al 2010). Implementation of vegetation treatment activities under the WVFMP has the potential to increase rates of soil erosion and loss of topsoil. UC Berkeley has not observed significant erosion associated with recent or past vegetation treatment activities in the Plan Area (Breines pers. comm. 2020). However, the Maymen soil series make up the bulk of the Plan Area and have the highest erosivity ratings in the Plan Area; therefore; it is likely that vegetation treatment activities would be implemented on this soil, thereby possibly resulting in increased rates of soil erosion. The impacts from implementing prescribed burning, mechanical treatments, manual treatments, and managed herbivory on erosion and loss of topsoil are described below. The proposed ground application of herbicides would not result in any ground disturbance and would not have any potential to cause erosion or loss of topsoil.

Manual Vegetation Treatment

Soil disturbance from manual vegetation treatments is considered negligible (Robichaud et al. 2010) and typically occur by manually pulling, grubbing, or digging out root systems of undesired plants. This negligible ground disturbance could not cause significant erosion or loss of topsoil.

Mechanical Vegetation Treatment

Use of mechanical equipment can increase soil disturbance, cause increased runoff, and cause increased fluvial erosion as well as compact soils and cause rutting (Page-Dumroese et al. 2010), especially during saturated soil conditions. Compacted soil reduces infiltration capacity and generates overland flow (Robichaud et al. 2010). Bare soils are also prone to producing overland flow causing erosion and loss of topsoil. Equipment tracks can concentrate runoff. Increased surface runoff and the availability of easily transportable soil increases the likelihood of rain splash, sheetwash, rill, and gully erosion (Reid 2010, Robichaud et al. 2010). Mechanical equipment can decrease soil cover and vehicles can break down soil structure and increase the erodibility of the soil by both water and wind. Heavy equipment on steep slopes can cause extensive soil disturbance.

To address this risk, EPM AQ-2 requires exposed surfaces to be watered twice per day which minimizes potential for wind erosion, EPM BIO-7 minimizes ground disturbance from vehicles, EPM GEO-1 requires suspension of mechanical soil disturbance during and after precipitation, EPM GEO-2 requires stabilization of disturbed soil areas, EPM GEO-3 prohibits use of heavy equipment on slopes steeper than 30 percent, EPM GEO-4 requires stormwater to be drained via water breaks which would decrease the potential for channelized erosion down the fuel break, and EPM GEO-5 requires evaluation of treatment areas with slopes greater than 50 percent for unstable areas.

Prescribed Broadcast Burning

Prescribed burns can cause increased soil disturbance, increased runoff, and increased fluvial erosion. Broadcast burning can remove litter and surface fuels under low soil burn severity or can completely consume the duff and organic layer under high burn severity. Broadcast burning can remove the organic cover layer and expose mineral soil to rain splash and overland flow. Combustion of organic matter within the mineral soil can cause soil disaggregation, further increasing soil erodibility. Increased water repellency and the breakdown of soil structure will reduce the infiltration rate, and thereby increase erosion potential (Robichaud et al. 2010). If soil burn severity is high, post-fire reduction of infiltration capacity and the increased likelihood of soil sealing will lead to overland flow generation. Burning large areas can result in the excess surface flow being routed to convergent areas and low order streams (Robichaud et al. 2010). If burn severity is high, increased overland flow and exposure of mineral soil can lead to rain splash, sheetwash, and rill erosion (Robichaud et al., 2010). Runoff concentration in convergent areas may lead to gully erosion, and excess runoff routed into low order streams may potentially lead to bank erosion (Reid 2010).

The objective of prescribed broadcast burns is to reduce the risk of high severity wildfires which increase runoff and erosion rates by two or more orders of magnitude, while low and moderate severity burns have much smaller effects on runoff and sediment yields (Robichaud et al. 2010). Typically, 70 percent of the vegetation remains in an area that is treated by broadcast burning, and vegetation usually regrows within a year which helps minimize the risk of erosion (CAL FIRE 2019). To address the risk of erosion and loss of topsoil, following a prescribed burn, UC Berkeley would stabilize bare soil areas to increase surface roughness and protect soil from erosion (EPM GEO-2), drain bare linear treatment areas via water breaks (EPM GEO-4), and evaluate areas with steep slopes for potential for erosion and implement necessary measures such that substantial erosion or loss of topsoil will not occur (EPM GEO–5).

Managed Herbivory

Managed herbivory can cause soil disturbance, increased runoff, and increased fluvial erosion. Mechanical force from the animal's hoof can compact soil, especially when soils have high moisture content. Compaction through trampling lowers the infiltration rate and increases the likelihood of overland flow (Salls et al. 2018). Animals can form trails or paths through repeated trampling which can concentrate runoff and alter drainage patterns (Trimble and Mendel 1995). The combination of grazing and trampling can reduce soil cover (Trimble and Mendel 1995). Increased runoff and bare erodible soil increase the likelihood of rain splash, sheetwash, and rill erosion. Herbivory can also lead to erosion of stream banks (Trimble and Mendel 1995).

As stated in Chapter 2, "Project Description, grazed areas would be examined daily to make sure the grasses are eaten to a low profile but high enough to prevent erosion and to prevent trail blazing by the goats (e.g., crating ruts in the soil). In addition, EPM HYD-1 will require that environmentally sensitive areas, such as waterbodies, wetlands, or riparian areas, be identified and excluded from managed herbivory treatment areas. To further minimize risk of erosion from managed herbivory, implementation of EPM GEO-1 will suspend managed herbivory during and after precipitation, EPM GEO-2 will stabilize disturbed soil areas, and EPM GEO-3 will minimize erosion by herding animals out of an area if accelerated erosion is observed. The impact of managed herbivory treatments on erosion after implementation of the EPMs is less than significant.

Biomass Disposal

Biomass created by implementation of the Plan would be treated in various ways; those with potential to affect geology and soils are chipping and spreading and pile burning. The mulch layer created by chipping and spreading onsite would help prevent erosion by protecting the soil from the erosive forces of wind and water. Biomass would also be disposed of using pile burning. Pile burning can completely consume the duff and organic layer under high soil burn severity (USDA 2005). Removal of the upper soil organic layer can expose mineral soil to rain splash and overland flow. Combustion of organic matter within the mineral soil can cause soil disaggregation, further increasing soil erodibility (Robichaud et al. 2010). Heating from the burn pile may create a water repellent layer in the soil. Water repellency, lack of cover, and the increased likelihood of soil sealing can lead to overland flow generation in the areas where piles were burned (Larsen et al. 2009, Robichaud et al. 2010). Additionally, increased overland flow and exposure of mineral soil can lead to rain splash, sheetwash, and rill erosion within the footprint of the burn pile (Reid 2010, Robichaud et al. 2010). To address the risk of erosion and loss of topsoil, following a pile burn, UC Berkeley would stabilize bare soil areas to increase surface roughness and project soil from erosion (EPM GEO-2).

Access Roads and Landings

Erosion of access roads and landings used to implement vegetation treatment activities could also occur in the Plan Area. The Plan Area contains unpaved access roads and 22 existing unpaved landings that were either used previously or are located on flat areas suitable for use with minimal ground disturbance. No new landings or access roads would be created, although minor grading and clearing would be required to reestablish some of the landings. Within disturbed areas of bare soil (vehicle tracks, soil exposed during mechanical shrub removal, or other soil disturbances), all signs of erosion, which include rills, large erosional features, and sloughed soil/seeding materials will be noted and mapped on aerial photographs or with a handheld GPS unit, where accessible (UC Berkeley 2020). A Stormwater Pollution Prevention Plan (SWPPP) would be required for grading activities that are over an acre which would prescribe best management practices to control erosion from access roads and landings.

Summary

With the implementation of the EPMs to minimize risk of erosion from wind and water described under each vegetation treatment activity, the risk of substantial erosion or loss of topsoil from vegetation treatment activities is **less than significant**.

As described in Section 2, “Program Description,” one of the primary purposes of the WVFMP is to reduce wildfire risk in the Plan Area. Catastrophic wildfires may occur if the vegetation in an area is not managed. If burn severity is high, increased overland flow and exposure of mineral soil can lead to rain splash, sheetwash, and rill erosion (Robichaud et al. 2010). While implementation of the WVFMP may result in some erosion and loss of topsoil during treatments, it is anticipated to reduce the occurrence and severity of wildfires that can result in substantial erosion and loss of topsoil. An analysis performed after the Clearwater Fire in Idaho found that the ”increase in sediment delivery associated with the proposed [vegetation treatment] activities will likely be offset by the reduced risk of fire, the reduced severity of a fire should it occur, and the reduction in hillslope sediment delivery following a wildfire” (Lake Tahoe West Science Group 2018). Given the unpredictability of wildfire occurrence and severity, it is not possible to evaluate the effect of wildfire-caused erosion in the Plan Area, nor is it pertinent to determining this impact under CEQA. However, it is anticipated that the WVFMP would decrease the risk of erosion in areas that could otherwise be at substantial risk of erosion after burning in a high-severity wildfire.

Identified Treatment Projects

The potential for proposed Identified Treatment Projects to cause erosion or loss of topsoil is presented in Table 3.6-7. The table includes treatment activities that could result in increased erosion and the acres within the treatment area with moderate to high soil erosivity factors (i.e., a K factor above 0.20). None of the Identified Treatment Projects include prescribed burning or managed herbivory as a treatment activity. The only treatment activity proposed for the projects with the potential to result in erosion or loss of topsoil is mechanical treatment. The mechanisms by which mechanical treatment could result in these impacts is described above for the overall WVFMP.

Table 3.6-7 Identified Treatment Projects and Risk of Erosion

Identified Treatment Project	Proposed Treatment Activities That Could Accelerate Erosion	Acres of Project Area With K Factor Above 0.20
Strawberry Fire Hazard Reduction	mechanical, minor grading of access roads and six landings	18.6
Frowning Fire Hazard Reduction	mechanical, minor grading of access roads and 11 landings	37.2
Claremont Fire Hazard Reduction	mechanical, minor grading of access roads and four landings	25.5
Hearst Gate Fuel Break	none	1.2
East-West Fuel Break	mechanical	17.9
TRA 1	mechanical	0.1
TRA 2	mechanical	0.7
TRA 3	mechanical	0.7
TRA 4	none	none

Source: Compiled by Ascent Environmental

The Hearst Gate Fuel Break would be implemented using manual treatment and herbicide application, which would not lead to accelerated erosion. TRA 4 would be located on an existing paved area, and because no treatment activities are proposed, no erosion could occur. The Fire Hazard Reduction Projects and the East-West Fuel Break project have the potential to cause the most erosion because they include mechanical treatment activities within the largest areas of soil having moderate to high erosivity factors. To address this risk, each project would implement EPM AQ-2 which requires exposed surfaces to be watered twice per day to minimize potential for wind erosion; EPM BIO-7 which minimizes ground disturbance from vehicles; EPM GEO-1 which requires suspension of mechanical soil disturbance during and after precipitation; EPM GEO-2 which requires stabilization of disturbed soil areas; EPM GEO-3 which prohibits use of heavy equipment on slopes steeper than 30 percent; EPM GEO 4 which requires stormwater to be drained via water breaks which would decrease the potential for channelized erosion down the fuel break; and EPM GEO-5 which requires evaluation of treatment areas with slopes greater than 50 percent for unstable areas. With the implementation of these EPMs, the risk of substantial erosion or loss of topsoil from the Identified Treatment Projects is **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

Impact GEO-2: Result in Increased Risk of Landslide

Vegetation treatment activities implemented under the WVFMP could increase the risk of landslide by removing the plant root structures which stabilize slopes. Additionally, by removing vegetation, the soil water content could increase due to lack of uptake and transpiration by the vegetation. Higher soil water content could potentially destabilize slopes and increase the risk of landslide. Landslide risk is higher in areas with steeper slopes and where previous landslide has occurred. Implementation of EPMs GEO-2, GEO-3, and GEO-5 would avoid or minimize the risk of landslide resulting from WVFMP treatments. This impact would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects.

<u>Overall WVFMP</u>

The Plan Area has a high risk of landslides because landslides have occurred in the area and the best indicator of high landslide potential is evidence of previous landsliding (Highland and Bobrowsky 2008). CGS has mapped historic landslides in the Plan Area (CGS 2020a) (Figure 3.6-3). The stability of a slope is determined by steepness, soil type, underlying geologic material type and structure, vegetation, subsurface water content, and prior human manipulation. CGS has also mapped deep-seated landslide susceptibility in the Plan Area, which shows that much of the Plan Area is mapped as the highest landslide susceptibility class (Willis et. al. 2011, CGS 2020b) (Figure 3.6-4). Implementing the WVFMP would reduce vegetation, potentially increase subsurface water content, and occur on steep slopes, all of which could increase the risk of landslides and debris flows.

Removing vegetation during all of the treatment activities implemented under the WVFMP could potentially increase the risk of landslide by removing root systems that stabilize slopes. All types of treatment activities would result in direct removal of root systems or indirect loss of root systems by eventual decay due to the removal of the surface plant. The presence of root systems also reduce soil moisture content through evapotranspiration. Removing vegetation could potentially increase the risk of landslide by removing vegetation which no longer uptakes ground water thereby increasing water content of the soil resulting in soils more prone to sliding. A rising groundwater table ("bottom up" saturation) within the saturated zone leads to a gradual growth of porewater pressure in the soil which leads to destabilization of slopes and can lead to failure of slopes (Bronnimann 2011). Other factors such as bedding plane orientation and properties of the geologic materials can play an important role on susceptibility to landslides. Treatment activities proposed on steep slopes would increase risk of landslides, in combination with the factors described above.

Because herbicides would only be applied by hand to stumps, resprouts, and target foliage under the WVFMP, treated material would already have been removed (e.g., in the case of cut stump applications), or be limited to isolated plants or small, intermittent areas of target vegetation. These methods of herbicide application would not affect large areas of vegetation and associated root systems such that substantial slope destabilization would occur. Any increased risk of landslide due to other treatment activities proposed under the WVFMP would be minimized with EPM GEO-2 which requires stabilization of disturbed soil; EPM GEO-3 which prohibits heavy equipment on slopes steeper than 30 percent; and EPM GEO-5 which requires that a RPF or licensed geologist evaluate treatment areas with slopes greater than 50 percent for unstable areas. With the implementation of the EPMs, the increased risk of landslide from vegetation treatment activities is **less than significant**.

One of the primary purposes of the WVFMP is to reduce wildfire risk in the Plan Area. As described above, moderate to high severity wildfire can greatly increase the risk of landslides, including the likelihood of debris sliding and debris flows. Given the unpredictability of wildfire occurrence and severity, evaluating the effect of the WVFMP on wildfire-caused landsliding is not possible, nor is it pertinent to determining the significance of this impact under CEQA. However, it is anticipated that the WVFMP would decrease the risk of landslide in areas that could otherwise be at substantial risk of landslide after burning in a high-severity wildfire.

Identified Treatment Projects

The potential for proposed Identified Treatment Projects to increase risk of landslide is presented in Table 3.6-8. The table includes proposed treatment activities and the portion of the treatment area with high potential for deep-seated landslide (i.e., VIII, IX, and X) (Willis et. al. 2011, CGS 2020b) (Figure 3.6-4). None of the Identified Treatment Projects include prescribed burning or managed herbivory as a treatment activity. The table also includes the area within the treatment area that overlaps with historic landslides (CGS 2020a) (Figure 3.6-3). The mechanisms by which treatment activities could result in an increased risk of landslide is described above for the overall WVFMP.

Table 3.6-8 Identified Treatment Projects and Risk of Landslide

Identified Treatment Project	Proposed Treatment Activities That Could Increase Landslide Risk	Area mapped as highest potential for deep-seated landslide (Willis et. al. 2011, CGS 2020b)	Acres of Project Area that overlap with historic landslides (CGS 2020a)
Strawberry Fire Hazard Reduction	Mechanical	Eastern portion	4.1
Frowning Fire Hazard Reduction	Mechanical	Southern portion	3.3
Claremont Fire Hazard Reduction	Mechanical	All	3.4
Hearst Gate Fuel Break	None	None	None
East-West Fuel Break	Mechanical	Central portion	0.6

Identified Treatment Project	Proposed Treatment Activities That Could Increase Landslide Risk	Area mapped as highest potential for deep-seated landslide (Willis et. al. 2011, CGS 2020b)	Acres of Project Area that overlap with historic landslides (CGS 2020a)
TRA 1	Mechanical	Some overlap	none
TRA 2	Mechanical	Some overlap	0.2
TRA 3	Mechanical	Some overlap	0.01
TRA 4	None	none	0.3

Source: Compiled by Ascent Environmental

Manual vegetation treatment is generally used to remove target species for small-scale activities which have a low potential to increase the risk of landslide. Similarly, herbicide application would be targeted and therefore not increase the risk of landslide across a slope as discussed for the Overall WVFMP above. To address the increased risk of landslide from implementation of these projects from mechanical treatment activities, EPM GEO-3 prohibits heavy equipment on slopes greater than 30 percent and therefore the areas with the highest potential for landslide would not be affected by treatment implementation. To further reduce the risk of landslide, EPM GEO-2 requires stabilization of disturbed soil and EPM GEO-5 requires that a RPF or licensed geologist evaluate treatment areas with slopes greater than 50 percent for unstable areas. With the implementation of the EPMs, the increased risk of landslide from vegetation treatment activities implemented with these projects is **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

3.7 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

This section presents a summary of regulations and policies applicable to greenhouse gas (GHG) emissions and the WVFMP; reviews climate change science and GHG sources in California and the Plan Area; quantifies GHG emissions associated with treatment activities implemented under the WVFMP; and evaluates the potential for GHGs associated with implementation of the WVFMP to have a significant impact on the environment or conflict with applicable plans, policies, or regulations adopted for the purpose of reducing GHG emissions.

Comments on the Notice of Preparation related to GHGs and climate change included consideration of the carbon storage capacity of eucalyptus trees and the protection of existing mature trees instead of removing trees to combat climate change and maintain carbon sequestration. Discussion about the long-term effect implementation of the WVFMP would have on carbon sequestration is included in Impact GHG-2 in Section 3.7.3, "Impact Analysis and Mitigation Measures." Comments also requested consideration of how future climate change will affect implementation of the WVFMP. Later treatments implemented under the WVFMP will be designed according to the specific characteristics of each treatment site, including the type of vegetation present at the time of treatment and the objectives of the treatment. This inherent flexibility in the WVFMP would allow treatments to adapt to changing conditions resulting from future climate change.

3.7.1 Environmental Setting

THE PHYSICAL SCIENTIFIC BASIS OF GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

Certain gases in the earth's atmosphere, classified as GHGs, play a critical role in determining the earth's surface temperature. Solar radiation enters the earth's atmosphere from space. A portion of the radiation is absorbed by the earth's surface and a smaller portion of this radiation is reflected toward space. This absorbed radiation is then emitted from the earth as low-frequency infrared radiation. The frequencies at which bodies emit radiation are proportional to temperature. The earth has a much lower temperature than the sun; therefore, the earth emits lower frequency radiation. Most solar radiation passes through GHGs; however, infrared radiation is absorbed by these gases. As a result, radiation that otherwise would have escaped back into space is instead "trapped," resulting in a warming of the atmosphere. This phenomenon, known as the greenhouse effect, is responsible for maintaining a habitable climate on earth.

Prominent GHGs contributing to the greenhouse effect are carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Human-generated emissions of these GHGs in excess of natural ambient concentrations are found to be responsible for intensifying the greenhouse effect and leading to a trend of unnatural warming of the earth's climate, known as global climate change or global warming. It is "extremely likely" that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropomorphic increase in GHG concentrations and other anthropomorphic forcing (IPCC 2014:5). This warming is observable considering the 20 hottest years ever recorded occurred within the past thirty years (McKibben 2018).

Climate change is a global problem. GHGs are global pollutants, unlike criteria air pollutants and toxic air contaminants, which are pollutants of regional and local concern. Whereas most pollutants with localized air quality effects have relatively short atmospheric lifetimes (approximately one day), GHGs have long atmospheric lifetimes (from one year to several thousand years). GHGs persist in the atmosphere long enough to be dispersed around the globe. Although the lifetime of any GHG molecule depends on multiple variables and cannot be determined with perfect certainty, it is understood that more CO_2 is emitted into the atmosphere than is sequestered by ocean uptake, vegetation, and other forms of sequestration. Of the total annual human-caused CO_2 emissions, approximately 55 percent are estimated to be sequestered through ocean and land uptake every year, averaged over the last 50 years, whereas the remaining 45 percent of human-caused CO_2 emissions remain stored in the atmosphere (IPCC 2013:467).

The quantity of GHGs in the atmosphere responsible for climate change is not precisely known, but it is enormous. No single project alone would measurably contribute to an incremental change in the global average temperature or to global or local climates or microclimates. From the standpoint of CEQA, GHG impacts to global climate change are inherently cumulative.

GREENHOUSE GAS EMISSION SOURCES

GHG emissions are attributable in large part to human activities associated with the industrial/manufacturing, transportation, utility, commercial, residential, and agricultural emissions sectors (CARB 2014). In California, the transportation sector is the largest emitter of GHGs, followed by the industrial/manufacturing sector (CARB 2019a). Emissions of CO_2 are byproducts of fossil fuel combustion. Methane, a highly potent GHG, primarily results from off-gassing (the release of chemicals from nonmetallic substances under ambient or greater pressure conditions) and is largely associated with agricultural practices organic material decomposition in landfills, and the burning of forest fires (Black et al. 2017). Nitrous oxide emissions are largely attributable to agricultural practices and soil management. CO_2 sinks, or reservoirs, include vegetation and the ocean, which absorb CO_2 through sequestration and dissolution (CO_2 dissolving into the water), respectively, two of the most common processes for removing CO_2 from the atmosphere.

The total GHG inventory for California in 2017 was 424 $MMTCO_2e$ (CARB 2019a). This is less than the 2020 target of 431 $MMTCO_2e$, which is equal to the inventory for 1990 (CARB 2018:1). The most recent GHG inventory for California is summarized below in Table 3.7-1, indicating that transportation, industry, and electricity generation are the largest GHG emission sectors.

Table 3.7-1 2017 Statewide GHG Emissions by Economic Sector[1]

Sector	Percent
Transportation	41
Industrial	24
Electricity generation (in state)	9
Electricity generation (imports)	6
Agriculture	8
Residential	7
Commercial	5

Source: CARB 2019

1 The inventory provides estimates of anthropogenic GHG emissions within California, as well as emissions associated with imported electricity; natural sources are not included in the inventory.

EFFECTS OF CLIMATE CHANGE ON WILDFIRE RISK

According to the Intergovernmental Panel on Climate Change (IPCC), which was established in 1988 by the World Meteorological Organization and the United Nations Environment Programme, global average temperature is expected to increase by 1.5 degrees Celsius (°C) (2.7 degrees Fahrenheit [°F]) by 2040 (IPCC 2018). This 1.5 °C warming represents a global average indicating that some portions of the earth will experience more dramatic warming than others, and thus the extent of climate change effects on individual regions will vary. Long-term effects of climate change include rising temperatures; changes in precipitation patterns; increased severe weather events such as droughts, heat waves, and hurricanes; and sea-level rise. These effects have the potential to threaten transportation and energy infrastructure, crop production, forests and rangelands, and public health (CNRA 2018:64, 116–117, 127; OPR, CEC, and CNRA 2018:7–14). The effects of climate change will also have an indirect adverse impact on the economy as more severe natural disasters, such as frequent and catastrophic wildfires, cause expensive, physical damage to communities.

Other environmental resources could be indirectly affected by the accumulation of GHG emissions and resulting rise in global average temperature. In recent years, California has been marked by extreme weather and its effects. According to California's Fourth Climate Change Assessment, Statewide Summary Report (2018), if global GHGs are reduced at a moderate rate, California will experience average daily high temperatures that are warmer than the historic average by 2.5 °F from 2006 to 2039, by 4.4 °F from 2040 to 2069, and by 5.6 °F from 2070 to 2100. If GHG emissions continue at current rates, then California will experience average daily high temperatures that are warmer than the historic average by 2.7 °F from 2006 to 2039, by 5.8 °F from 2040 to 2069, and by 8.8 °F from 2070 to 2100 (OPR, CEC, and CNRA 2018:5). The potential effects of this warming in California are well documented. Since its previous climate change assessment in 2012, California has experienced several of the most extreme natural events in its recorded history: a severe drought from 2012-2016, an almost non-existent Sierra Nevada winter snowpack in 2014-2015, back-to-back years of the warmest average temperatures, and increasingly large and severe wildfires (OPR, CEC, and CNRA 2018:3).

According to CNRA's draft report, *Safeguarding California Plan: 2017 Update* (CNRA 2017), California experienced the driest four-year statewide precipitation on record from 2012 through 2015; the warmest years on average in 2014, 2015, and 2016; and the smallest and second smallest Sierra snowpack on record in 2015 and 2014 (CNRA 2017). In contrast, the northern Sierra Nevada range experienced its wettest year on record in 2016 (CNRA 2017). The changes in precipitation exacerbate wildfires throughout California with increasing frequency, size, and devastation. As temperatures increase, the increase in precipitation falling as rain rather than snow also could lead to increased potential for floods because water that would normally be held in the snowpack of the Sierra Nevada and Cascade mountains until spring would flow into the Central Valley concurrently with winter rainstorm events. This scenario would place more pressure on California's levee/flood control system (CNRA 2017). Furthermore, in the extreme scenario involving the rapid loss of the Antarctic ice sheet, sea level along California's coastline could rise up to 10 feet by 2100, which is approximately 30 to 40 times faster than sea level rise experienced over the last century (CNRA 2017).

Climate change has led to the exacerbation of wildfire conditions in two major ways: earlier spring snowmelt and reduced winter precipitation. These conditions have resulted in a longer wildfire season, and cycles of heavy precipitation followed by drought conditions to increase fuel loading in wet years and reduce moisture-content during droughts. One study estimates that the western U.S. has experienced a doubling of area burned by wildfire from anthropogenic climate change (Abatzoglou and Williams 2016). These conditions have resulted in the largest, most destructive, and deadliest wildfires on record in California history. Nine of the state's 10 deadliest wildfires have occurred since 2003. According to California's Fourth Climate Change Assessment, if GHG emissions continue to rise, the frequency of extreme wildfires burning over 25,000 acres could increase by 50 percent by 2100 and the average area burned statewide could increase by 77 percent by the end of the century (OPR, CEC, and CNRA 2018).

Water availability and changing temperatures, which affects prevalence of pests, disease, and species, directly impact crop development and livestock production. Other environmental concerns include decline in water quality, groundwater security, and soil health (CNRA 2017). Vulnerabilities of water resources also include risks to degradation of watersheds, alteration of ecosystems and loss of habitat, impacts to coastal areas, and ocean acidification (CNRA 2017).

Cal-Adapt, a climate change scenario planning tool developed by the CEC, downscales global climate model data to local and regional resolution under two emissions scenarios: the RCP 8.5 scenario represents a business-as-usual future emissions scenario, and the RCP 4.5 scenario represents a lower GHG emissions future. Based on analysis using the Cal-Adapt tool, annual average temperatures in Alameda County where the project area is located are projected to rise from 4.1 to 7.7 °F by 2099, a range based on low (RCP 4.5) and high (RCP 8.5) emissions scenarios (CEC 2020).

Alameda County, in which most of the Plan Area is located, experienced an annual average high temperature of 66.3 °F between 1950 and 2005. Under the RCP 4.5 scenario, the county's annual average high temperature is projected to increase by 1.9 °F to 68.2 °F by 2050 and increase an additional 1.9 °F to 70.1 °F by 2099 (CEC 2020). Under the RCP 8.5 scenario, the county's annual average high temperature is projected to increase by 2.2 °F to 68.5 °F by 2050 and increase an additional 3.7 °F to 72.2 °F by 2099 (CEC 2020). A relatively small portion of the Plan Area is in in Contra Costa County, in which similar changes are expected.

Alameda County experienced an average precipitation of 22.6 inches per year between 1950 and 2005. Under the RCP 4.5 scenario, the county is projected to experience an increase of 2.4 inches to 25.0 inches per year by 2050 and decrease to 24.6 inches per year by 2099 (CEC 2020). Under the RCP 8.5 scenario, the county is projected to experience an increase of 1.7 inches to 24.3 inches per year by 2050 and increase to 26.8 inches per year by 2099 (CEC 2020).

3.7.2 Regulatory Setting

GHG emissions in California, including within the Plan Area, are regulated by federal, state, regional, and local government agencies. These agencies aim to reduce GHG emissions to lessen the impact of global climate change through legislation, planning, policymaking, education, and a variety of programs. The regulations and the agencies responsible for regulating GHGs within the Plan Area are discussed below and are applicable at both the program and project level, unless otherwise noted.

FEDERAL

In *Massachusetts et al. v. Environmental Protection Agency et al.*, 549 U.S. 497 (2007), the Supreme Court of the United States ruled that CO_2 fit within the definition of "air pollutant" under the federal Clean Air Act and that the U.S. Environmental Protection Agency (EPA) has the statutory authority to regulate GHG emissions. Treatment activities under the Plan have the potential to generate GHG emissions through use of off-road equipment, machine-powered hand tools, helicopters, vehicles for worker commute, trucks for materials delivery and hauling, and prescribed burning.

In October 2012, EPA and the National Highway Traffic Safety Administration, issued final rules to further reduce GHG emissions and improve corporate average fuel economy (CAFE) standards for light-duty vehicles for model years 2017 and beyond (77 Federal Register [FR] 62624). These rules would have increased fuel economy to the equivalent of 54.5 miles per gallon, limiting vehicle emissions to 163 grams of CO_2 per mile for the fleet of cars and light-duty trucks by model year 2025 (77 FR 62630). However, on April 2, 2018, the EPA administrator announced a final determination that the current standards are not appropriate and should be revised. On August 2, 2018, the U.S. Department of Transportation and EPA proposed the Safer Affordable Fuel-Efficient Vehicles Rule, which would amend existing CAFE and tailpipe CO_2 emissions standards for passenger cars and light trucks and establish new standards covering model years 2021 through 2026.

Effective September 6, 2019, EPA, under authority of the Clean Air Act section 111(d), repealed the Clean Power Plan and issued the Affordable Clean Energy rule (ACE), which provides guidance to states on establishing emissions performance standards for coal-fired electric generating units (EGUs). Under this rule, states are required to submit plans to the EPA which demonstrate the use of specifically listed retrofit technologies and operating practices to achieve CO_2 emission reductions though heat rate improvement (HRI). HRI is a measurement of power plant efficiency that EPA determined as part of this rulemaking to be the best system of emission reductions for CO_2 generated from coal fired EGUs (EPA 2019). Vehicles used for worker commutes and hauling equipment, livestock, and biomass associated with treatments implemented under the Plan would be subject to CAFE standards.

Safer Affordable Fuel-Efficient Vehicles Rule

On August 2, 2018, EPA and NHTSA (National Highway Traffic Safety Administration) proposed the Safer Affordable Fuel-Efficient Vehicles Rule (SAFE Rule). This rule addresses emissions and fuel economy standards for motor vehicles and is separated in two parts as described below.

Part One, "One National Program" (84 FR 51310), revokes a waiver granted by EPA to the state under Section 209 of the Clean Air Act to enforce more stringent emission standards for motor vehicles than those required by EPA for the explicit purpose of GHG emission reduction, and indirectly, criteria air pollutant and ozone precursor emission reduction. This revocation became effective on November 26, 2019, restricting the ability of CARB to enforce more stringent GHG emission standards for new vehicles and set zero emission vehicle mandates in California. CARB has estimated the vehicle tailpipe and evaporative emissions impacts to criteria air pollutants resulting from the enactment of SAFE Rule Part One and has provided off-model adjustment factors to adjust emission factors provided by CARB's Emission Factor (EMFAC) model.

Part Two of the SAFE Rule, jointly developed by NHTSA and EPA, addresses CAFE standards, which are set by NHTSA, for passenger cars and light trucks, model years 2021 to 2026. This rulemaking sets new CAFE standards for model years 2022 through 2026 and amends existing CAFE standards for model year 2021. Model year 2020 standards (specifically, the footprint target curves for passenger cars and light trucks) are retained through model year 2026. EPA is also setting new tailpipe carbon dioxide standards for the same model years of the same vehicles, but comment is sought on a range of alternatives discussed throughout the rule. On March 31, 2020, NHTSA and EPA finalized SAFE Rule Part Two. The implications of any pending or potential lawsuits that could delay or affect its implementation are unknown at this time.

STATE

Statewide GHG Emission Targets and the Climate Change Scoping Plan

Reducing GHG emissions in California has been the focus of state government policy for approximately two decades (CARB 2019b). GHG emission targets established by the state legislature include reducing statewide GHG emissions to 1990 levels by 2020 (Assembly Bill [AB] 32, Statutes of 2006) and to 40 percent below 1990 levels by 2030 (Senate Bill [SB] 32, Statutes of 2016). Executive Order S-3-05 calls for statewide GHG emissions to be reduced to 80 percent below 1990 levels by 2050. Executive Order B-55-18 calls for California to achieve carbon neutrality by 2045 and achieve and maintain net negative GHG emissions thereafter. These targets are in line with the scientifically established levels needed in the U.S. to limit the rise in global temperature to no more than 2 degrees Celsius (3.6 °F), the warming threshold at which major climate disruptions, such as super droughts and rising sea levels, are projected. These targets also are consistent with efforts to further limit the temperature increase to 1.5 degrees Celsius (2.7 °F) (United Nations 2015:3).

California's 2017 Climate Change Scoping Plan (2017 Scoping Plan), prepared by the California Air Resources Board (CARB), outlines the main strategies California will implement to achieve the legislated GHG emission target for 2030 and "substantially advance toward our 2050 climate goals" (CARB 2017a:1, 3, 5, 20, 25–26). It identifies the reductions needed by each GHG emission sector (e.g., transportation, industry, electricity generation, agriculture, commercial and residential, pollutants with high global warming potential, and recycling and waste). Statewide GHG emission reduction targets and the 2017 Scoping Plan are applicable to the Plan because GHG emissions would be generated by treatment activity implemented under the Plan. Furthermore, an objective of the Plan is to contribute to meeting California's GHG emission goals by managing forests and other natural and working lands as a net carbon sink, consistent with the 2017 Scoping Plan.

The 2017 Scoping Plan identifies a 15–20 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) reduction from business-as-usual emissions from the natural and working lands sector to meet the state's 2030 target. This section includes lands used for agriculture, grazing, and forestry. This reduction would be achieved through carbon sequestration in trees, other vegetation, soils, and aquatic sediment (CARB 2017a:14). Recent trends indicate that from 2001 to 2010, approximately 120 million metric tons of carbon was lost through wildland fire. California's climate objective for natural and working lands is to maintain them as a carbon sink (i.e., net zero or negative GHG emissions) and, where appropriate, minimize the net GHG and black carbon emissions associated with management, biomass utilization, and wildfire events. To achieve this objective, the *2017 Scoping Plan* focuses on continued research and development to advance the state of science on carbon dynamics, develop a natural and working lands inventory, and directs the California Natural Resources Agency (CNRA) and other state agencies to complete a Natural and Working Lands Climate Change Implementation Plan consistent with the carbon neutrality goal of Executive Order B-55-18. Specifically, the *2017 Scoping Plan* acknowledges the role of fuel reduction treatments and prescribed burns in managing natural and working lands to reduce GHG emissions (CARB 2017a:87). Development of the Natural and Working Lands Climate Change Implementation Plan is discussed in greater detail below.

Draft 2030 Natural and Working Lands Implementation Plan

In a joint, interagency effort, the California Environmental Protection Agency (CalEPA), California Department of Food and Agriculture (CDFA), CNRA, CARB, and California Strategic Growth Council (SGC) released the *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan* in January 2019. The draft plan is specific to the natural and working lands sector, which includes farmland, rangeland, forests, grasslands, wetlands, riparian areas, seagrass, and urban green space. The draft plan addresses the carbon flux from this sector, including the ever-dynamic changes in both GHG emissions and carbon sequestration associated with the management of these lands. It is estimated that California's natural and working lands lost approximately 170 MMT of carbon between 2001 and 2014. Most of these losses were due to wildfire. This loss of carbon is equivalent to cumulative emissions of 630 $MMTCO_2e$ of previously sequestered carbon removed from the land over the same period (applying the atomic weight ratio of 3.67 for carbon to CO_2). However, not all the carbon lost was emitted to the atmosphere as CO_2. Some carbon leaves the land but persists in durable wood products. Other carbon losses are part of normal ecosystem function (CalEPA et al. 2019:9). The draft plan serves as a multi-disciplinary approach to conserve and maintain a resilient natural and working lands sector that will gradually shift the natural and working lands sector from being a net carbon emitter to being a net carbon sink, while also improving air quality, water quality, wildlife habitat, recreation, and providing other benefits. The draft plan sets goals for, at a minimum, increasing the rate of state-funded soil conservation practices fivefold, doubling the rate of state-funded forest management and restoration efforts, tripling the rate of state-funded oak woodland and riparian reforestation, and doubling the rate of state-funded wetland and seagrass restoration (CalEPA et al. 2019:13). The measures included in the draft plan are projected to result in cumulative emissions of 21.6 to 56.8 $MMTCO_2e$ by 2030 and cumulative emissions reduction of -36.6 to -11.7 $MMTCO_2e$ by 2045 (CalEPA et al. 2019:13-14).

The draft plan indicates that these GHG reductions will be met through a variety of practices under four broad pathways: conservation, forestry, restoration, and agriculture. One suite of practices is called, "Forestry – Improved forest health and reduced wildfire severity." This suite of practices includes prescribed fire, mechanical thinning, and understory treatment. It aims to "restore health and resilience to overstocked forests and prevent carbon losses from severe wildfire, disease, and pests." The draft plan notes that, although fuel reduction treatments involve near-term carbon costs, they result in long-term net carbon benefits in California. Fuel reduction activities, such as mechanical treatment and prescribed burning, reduce stand densities and fuel loads and lower the potential for damaging, high-severity fire, which is currently the primary cause of GHG emissions and carbon loss from the land sector. In the long-term, these activities are expected to result in climate benefits and healthier, more stable, and more resilient forests (CalEPA et al. 2019:14). The WVFMP is evaluated for consistency with the *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan*.

California Forest Carbon Plan

In January 2017, the California Department of Forestry and Fire Protection (CAL FIRE), in coordination with CNRA and CalEPA, released the *California Forest Carbon Plan*. This plan serves to implement policies to meet the forest carbon goals embodied in the *2017 Scoping Plan* and is aligned with the objectives of the WVFMP. Currently, much of California's forests are unhealthy, supporting unnatural density that lacks resilience to drought, disease, insect and parasite infestation, and large, severe wildfire. The plan describes forest conditions across California; provides a projection of future conditions in consideration of climate change; and describes goals and related specific actions that may be taken to improve forest health, including resilient carbon sequestration (CAL FIRE, CNRA, and CalEPA 2018).

Transportation-Related Standards and Regulations

The state has also passed legislation addressing GHG emissions associated with industrial sources, transportation, electricity generation, and energy consumption, as summarized below. Treatment activities under the Plan would involve fuel consumption and the use of on-road and off-road vehicles, which are subject to transportation-related standards and regulations.

As part of its Advanced Clean Cars program, CARB established more stringent GHG emission standards and fuel efficiency standards for fossil fuel–powered on-road vehicles. In addition, the program's zero-emission vehicle (ZEV) regulation requires battery, fuel cell, and plug-in hybrid electric vehicles to account for up to 15 percent of California's new vehicle sales by 2025 (CARB 2016a:15). By 2025, when the rules will be fully implemented, GHG emissions from the statewide fleet of new cars and light-duty trucks will be reduced by 34 percent and cars will emit 75 percent less smog-forming pollution than the statewide fleet in 2016 (CARB 2016b:1).

Executive Order B-48-18, signed into law in January 2018, requires all state entities to work with the private sector to have at least 5 million ZEVs on the road by 2030, as well as 200 hydrogen fueling stations and 250,000 electric vehicle–charging stations installed by 2025. It specifies that 10,000 of these charging stations must be direct-current fast chargers.

CARB adopted the Low Carbon Fuel Standard (LCFS) in 2007 to reduce the carbon intensity of California's transportation fuels. The LCFS applies to fuels used by on-road motor vehicles and by off-road vehicles, including construction equipment (Wade, pers. comm., 2017). In September 2018, CARB approved amendments to the LCFS to require a 20 percent reduction in carbon intensity by 2030 to further the state towards the 2030 GHG reduction target. The staff report that accompanied the amendments estimated that from January to March 2018, biomass-based diesel averaged 14 percent of every gallon of diesel sold in the state and renewable natural gas (e.g., biogas) was 68 percent of all fuel used in natural gas vehicles (CARB 2018:EX-1).

California's Climate Adaptation Strategy

California's overall plan for climate adaptation is expressed in *Safeguarding California Plan: 2018 Update* (CNRA 2018). The plan provides policy guidance for state decision-makers and is part of continuing efforts to reduce impacts and prepare for climate risks. The plan includes 76 policy recommendations across 11 policy sectors. One of the key sectors is forestry, which includes: restoring and protecting forest ecosystem function by reintroducing fire and improving management, protecting California's forest base, and enhancing watershed health; supporting community resilience by rebuilding California's forest management workforce, expanding the extent and health of California's urban tree canopy, and advancing fire preparedness; and fostering creative solutions to sustainably use biomass from fuels reduction activities and to better understand climate trends in forests via research and monitoring. Goal F-1 of the plan is to restore fire as a core ecological process, complemented by fuels reduction, working forests, and thinning to enhance forest health, resilience, and long-term carbon stability (CNRA 2018:4, 116–117, 127). The objectives of the WVFMP align with this plan.

LOCAL

As a constitutionally created state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies. Therefore, relevant regulations are summarized below.

University of California Sustainable Practices Policy

At the direction of the Regents of the University of California, UCOP developed a Sustainable Practices Policy which establishes sustainability goals to be achieved by all campuses, medical centers, and the Lawrence Berkeley National Laboratory within the UC system. This policy was adopted by the UC system and is regularly updated, with the most recent update occurring in January 2018. It requires UC campuses to achieve carbon neutrality of Scope 1 and 2 emissions by 2025 and carbon neutrality of Scope 3 emissions by 2050. The policy goals encompass nine areas of sustainable practices: green building, clean energy, transportation, climate protection, sustainable operations, waste reduction and recycling, environmentally preferable purchasing, sustainable food service, sustainable water systems.

The policy is regularly updated, with the most recent update occurring in January 2018. The policy goals encompass nine areas of sustainable practices: green building, clean energy, transportation, climate protection, sustainable operations, waste reduction and recycling, environmentally preferable purchasing, sustainable foodservice, sustainable water systems.

UC Berkeley Campus Sustainability Plan

UC Berkeley adopted its Campus Sustainability Plan to define a vision of long-term sustainability and describe steps being taken to achieve the vision (UC Berkeley 2013:2). The plan describes the broad campus commitment to sustainability in nine core areas and addresses the increased interest in and concern about the impacts of campus activities beyond those related to climate change. The Plan guides future work on campus and establishes a structure to identify and achieve continuous improvement. The nine core areas include energy and climate, water, built environment, waste, purchasing, transportation, food and dining, and land use.

UC Berkeley 2020 LRDP

The UC Berkeley 2020 LRDP contains the following policies related to GHGs and climate change that are applicable to the Plan (UC Berkeley 2005):

- **Policy: Incorporate sustainable design principles into capital investment decisions.** The policies in Strategic Investment require UC Berkeley to consider a range of alternate solutions at the feasibility phase of the project approval process. This analysis should include an evaluation of how each option supports the principles of sustainable design, which include:
    - minimizing energy use in travel to and within the campus,
    - minimizing the use of nonrenewable energy and material resources, and
    - minimizing adverse impacts to air and water quality.
- **Policy: Develop a campus standard for sustainable design specific to our site, climate, and facility inventory.** In consultation with the UC Office of the President, UC Berkeley should develop an internal evaluation and certification standard based on LEED and LABS 21 criteria as well as other sustainable design measures and guidelines, one which reflects both the unique composition of the UC Berkeley facility inventory and our temperate, semi-arid climate.

2020 LRDP Climate Change Amendment

- **Policy:** Design new projects to minimize energy and water consumption and wastewater production.
- **Policy:** Design all aspects of new projects to achieve campus short-term and long-term climate change emission targets established in the campus Climate Action Plan.

3.7.3 Impact Analysis and Mitigation Measures

ANALYSIS METHODOLOGY

State CEQA Guidelines Section 15064 and Appendix G direct a lead agency to consider the following factors when assessing the significance of GHG emissions:

- The extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting;
- Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project; and
- The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions.

This analysis assesses consistency of the WVFMP with state regulatory programs designed to reduce GHG emissions, especially in regard to the statewide GHG targets mandated by AB 32 of 2006 and SB 32 of 2016 (CARB 2017a:ES2, 2). This approach is consistent with one of the pathways to compliance presented in the California Supreme Court ruling, *Center for Biological Diversity v. California Department of Fish and Wildlife (2015) 62 Cal.4th 204, 229-231.* The WVFMP is evaluated for its consistency with adopted regulations, plans, and policies aimed at reducing GHG emissions, including the *2017 Scoping Plan* (CARB 2017a), *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan* (CalEPA et al. 2019), and the *California Forest Carbon Plan* (CAL FIRE, CNRA, and CalEPA 2018).

This analysis also estimates annual GHG emissions directly generated by treatment activities implemented under the Plan. Emissions generated by off-road equipment were estimated using emission factors derived from CARB's web-based OFFROAD/ORION model (CARB 2017b). Emissions generated by on-road vehicle trips were estimated using emission factors from the Emission Factor 2017 model (EMFAC2017, Version 1.0.2) (CARB 2020). Emissions from prescribed burns were estimated using emission factors from published research (Urbanski 2014) and fuel loading consumption rates from National Wildfire Coordinating Group's *Smoke Management Guide for Prescribed Fire* (NWCG 2018). GHG emissions from pile burning and the use of air curtain burners for the disposition of vegetative debris from mechanical and manual treatments were estimated using emission factors from Springsteen et al. (2015). Emissions from livestock used in prescribed herbivory treatments were estimated using emission rates for enteric fermentation published in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC 2006). All detailed calculations and assumptions are provided in Appendix F, "Air Quality and Greenhouse Gas Emissions Calculations."

No agency, including the Bay Area Air Quality Management District (BAAQMD), any other air district in California, or CAL FIRE, has developed a threshold of significance for greenhouse gas emissions that applies to vegetation treatment activities. For land use development projects BAAQMD recommends a mass emission threshold of 1,100 $MTCO_2e$ per year ($MTCO_2e$/year), or an efficiency metric or 4.6 $MTCO_2e$ per service population per year (where service population is the sum of residences and employees supported by the land use). For permitted stationary sources BAAQMD recommends a mass emission threshold of 10,000 $MTCO_2e$/year (BAAQMD 2017:2-4). Thus, BAAQMD's recommended quantitative thresholds are not applicable to the evaluation of vegetation treatment activities under the WVFMP, which would generate short-term GHG emissions but also result in long-term carbon benefits. This analysis qualitatively evaluates whether the annual GHG emissions generated by treatment activities implemented under the WVFMP would directly or indirectly have a significant impact on the environment. Using this qualitative approach, the WVFMP would have a significant impact on the environment if it would result in a substantial increase in GHG emissions such that it would conflict with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions. In addition, the analysis qualitatively recognizes the carbon benefits associated with implementation of the WVFMP over the long term, including a reduction in the occurrence and severity of future GHG-emitting wildfires and carbon sequestration provided by the growth of native vegetation on treated acres.

SIGNIFICANCE CRITERIA

An impact related to climate change and GHG emissions is considered significant if implementation of the WVFMP would:

- conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of GHGs; or
- generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.

ISSUES NOT EVALUATED FURTHER

All issues identified in State CEQA Guidelines Appendix G and listed above under Significance Criteria are evaluated below.

IMPACT ANALYSIS

Impact GHG-1: Conflict with Applicable Plan, Policy, or Regulation of an Agency Adopted for the Purpose of Reducing the Emissions of GHGs

Implementation of the WVFMP, including the Identified Treatment Projects, would be consistent with applicable plans, policies, and regulations aimed at reducing GHG emissions, including California's *2017 Climate Change Scoping Plan*, the *California Forest Carbon Plan*, and the *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan*. Objectives of the WVFMP include managing the amount and continuity of vegetation in the Hill Campus to reduce the occurrence and severity of future wildfire emissions and increase carbon sequestration. These objectives, and the activities that will be implemented to attain them, would reduce GHG emissions and increase carbon sequestration over the long term. Therefore, this impact would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects.

Overall WVFMP (Program-level Analysis)

Regulations, plans, and policies aimed at reducing GHG emissions from the natural lands in the Plan Area are the *2017 Scoping Plan, Draft California 2030 Natural and Working Lands Climate Change Implementation Plan,* and the *California Forest Carbon Plan*.

As described in Section 3.7.2, "Regulatory Setting," the *2017 Scoping Plan* lays out the framework for achieving compliance with statewide GHG targets mandated by SB 32 of 2016 (i.e., 40 percent below 1990 levels by 2030). To help meet the statewide target for 2030 the *2017 Scoping Plan* prescribed a 15–20 $MMTCO_2e$ reduction from business-as-usual emissions from the natural and working lands sector and determined that this reduction should be achieved through increased carbon sequestration and the reduction of wildfire emissions. The treatment activities implemented under the WVFMP would be consistent with the types of treatments called for in the *2017 Scoping Plan*, acknowledging the important role of fuel reduction treatments and prescribed burns in managing natural and working lands to reduce GHG emissions.

The *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan* has set a goal for, at a minimum, doubling the rate of state-funded forest management and restoration efforts, which include prescribed burns, mechanical treatments, and understory treatments. Implementation goals are 23,800–73,300 acres of prescribed burns per year, 59,000–73,000 acres of thinning per year, and 23,500–25,300 acres of understory treatment per year. The WVFMP would implement vegetation treatment on 600 acres of the 800-acre Plan Area at an annual average pace of 200 acres per year, which would contribute to the treatment targets set forth in the *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan* (of the 800-acre Plan Area, 200 acres would not undergo treatment because they are inaccessible or not expected to carry fire, due to the lack of vegetative fuels). Additionally, an indirect result of the WVFMP would be a decrease in GHG emissions by reducing wildfire and preventing the consumption of vegetation that acts as a net carbon sink, thus helping to meet California's GHG emission goals, consistent with the *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan*. Similarly, the WVFMP would help meet the acreage targets for forest restoration and treatment activity levels for nonfederal forest lands set forth in the *California Forest Carbon Plan*.

As stated in Section 2.3, "Objectives of the Plan," one of the objectives of the WVFMP is to be consistent with applicable plans, policies, and regulations aimed at reducing GHG emissions, such as California's *2017 Climate Change Scoping Plan,* the *California Forest Carbon Plan*, and the *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan*. Given that the WVFMP is aligned with the specific goals and strategies called out in these plans, as discussed above, the WVFMP would be consistent with state plans and policies for carbon management in natural and working landscapes. This impact would be **less than significant**.

Identified Treatment Projects (Project-level Analysis)

As described in the program-level analysis above, the objectives of the WVFMP would be consistent with applicable plans, policies, and regulations aimed at reducing GHG emissions, including California's *2017 Climate Change Scoping Plan*, the *California Forest Carbon Plan*, and the *Draft California 2030 Natural and Working Lands Climate Change*

Implementation Plan. Implementation of the Identified Treatment Projects, totaling approximately 123 acres of treatments (see Figure 2-2) in the 800-acre Plan Area, would be implemented to achieve the WVFMP objectives, including managing the amount and continuity of vegetation in the Hill Campus to reduce the occurrence and severity of future wildfire emissions and increase carbon sequestration. The WVFMP, and accordingly the Identified Treatment Projects that would be implemented under the Plan, would be consistent with state plans and policies for carbon management in natural and working landscapes. Therefore, this impact would be **less than significant** for Identified Treatment Projects.

Mitigation Measures

No mitigation is required for this impact.

Impact GHG-2: Generate GHG Emissions through Treatment Activities

Direct GHG emissions generated by initial treatment of the Plan Area would total approximately 3,183 $MTCO_2e$. On average, vegetation treatment activities would be implemented on 200 acres of the Plan Area each year, emitting approximately 1,061 $MTCO_2e$/year. Annual emissions would be lower in subsequent years because maintenance treatments would be less equipment intensive. Implementation of the Identified Treatment Projects would generate approximately 491 $MTCO_2e$ over two years. Implementation of the WVFMP, including the Identified Treatment Projects, would also provide carbon benefits over the long term, including a potential reduction in the occurrence and severity of future GHG-emitting wildfires and carbon sequestration provided by the growth of native vegetation on treated acres. Thus, because implementation of the WVFMP, including the Identified Treatment Projects, would be consistent with plans that address the carbon balance in natural and working lands that are part of state-wide mandates to achieve GHG reductions, the emissions generated by these treatments would not result in a significant impact. For these reasons, the impact of GHG emissions associated with treatment activities would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects.

<u>Overall WVFMP (Program-level Analysis)</u>

Treatment activities implemented under the WVFMP would result in GHG emissions directly generated by off-road equipment, on-road vehicles, and machine-powered hand tools. The combustion of vegetation during prescribed broadcast burns, pile burns, and in the air curtain burner produces GHGs, including CO_2, methane, and nitrous oxide. The livestock used in managed herbivory would generate relatively small amounts of methane through the process of enteric fermentation. Worker commute trips and hauling of equipment and biomass generated by treatments would also generate GHG emissions.

To provide a general understanding of the scale of emissions associated with treatment activities, the rates of GHG emissions resulting from each treatment activity (i.e., mechanical treatment, manual treatment, managed herbivory, herbicide application, and prescribed burning) are estimated on a per-acre basis and presented in Table 3.7-2. These estimates are based on the types and number of equipment that would be used by a treatment crew and the number of workers per treatment crew. The per-acre emission rates presented in Table 3.7-2 include emissions from off-road equipment and worker commute trips associated with the initial treatments. The estimated emissions for prescribed broadcast burning are predominately attributable to the combustion of vegetation. For mechanical treatment and manual treatment, the estimated rates also include emissions from the combustion of vegetation in pile burning onsite and air curtain burning offsite, both of which would be used for biomass disposition. As stated in Section 2, "Project Description," up to 60 percent of the vegetative debris produced by mechanical or manual treatments would be hauled to the UC Berkeley Richmond Field Station to be incinerated in an air curtain and 5 percent of the vegetative debris generated by mechanical and manual treatments would be burned in piles on site. Most subsequent maintenance treatments would involve less equipment and fewer workers than the initial treatments and some would involve as few as two workers using loppers or weed whips. Detailed input parameters and assumptions are provided in Appendix F, "Air Quality and Greenhouse Gas Emissions Calculations."

Table 3.7-2 Greenhouse Gas Emission Rates of Treatment Activities

Treatment Activity	Direct GHG Emissions per Acre Treated[1] ($MTCO_2e$/acre treated)
Prescribed Burning	16.3
Mechanical Treatment[2]	3.8
Manual Treatment[2]	4.3
Herbicide Application	0.01
Prescribed Herbivory[3]	0.1

Notes: $MTCO_2e$/acre = metric tons of carbon dioxide-equivalent per acre

[1] Emissions estimates do not include emissions generated by trucks hauling equipment and livestock to and from treatment sites at the beginning and end of each treatment. These emissions are nominal relative to treatment activity, but are provided in Appendix F.

[2] For mechanical treatment and manual treatment, the estimated emissions rates also include emissions associated with hauling approximately 60 percent of vegetative debris to the UC Berkeley Richmond Field Station and subsequent incineration in an air curtain burner, and the combustion of 5 percent of the vegetative debris generated by mechanical and manual treatments in burn piles onsite.

Source: See Appendix F for detailed calculations and assumptions.

The relative proportion of each treatment activity that would be implemented annually in the Plan Area would vary depending on areas requiring treatment and availability of funding. To provide an estimation of the level of GHG emissions that would result from implementation of the WVFMP, this analysis assumes that treatment activities would consist of approximately 45 percent mechanical treatments, 45 percent manual treatments, and 10 percent prescribed burning. As shown in Table 3.7-2, these are the three most GHG-intensive vegetation treatment activities. Based on the relative proportion of treatment activities and the per-acre emission rates presented in Table 3.7-2, it is estimated that the initial treatment of the entire acreage of the Plan Area in need of treatment would directly emit an approximate total of 3,183 $MTCO_2e$ over multiple years. Although this total acreage would not be treated in any single year, emissions were calculated using the initial treatment acreage to provide another metric for understanding the GHG intensity of implementing initial treatments of the entire WVFMP. On average, 200 acres of the Plan Area would be treated each year. Applying the same breakdown of treatment activities, treatment of 200 acres would generate approximately 1,061 $MTCO_2e$/year.

Equally important as the level of GHG emissions associated with implementation of the WVFMP, is that the WVFMP would also be carbon beneficial in multiple ways. Implementation of the WVFMP would reduce highly flammable invasive plant species and promote the growth of fire-resistant native plant species to reduce wildfire risk. The WVFMP would implement an adaptive management framework to promote the long-term effectiveness of vegetation management activities to reduce the occurrence and severity of future GHG-emitting wildfires. Also, future vegetative growth on treated acres would sequester carbon. Thus, while each treatment activity conducted under the WVFMP would generate a one-time mass of GHG emissions, implementation of the WVFMP would also provide ongoing carbon benefits from reduced occurrence and severity of future GHG-emitting wildfires and ongoing carbon sequestration.

However, there is no definitive method for quantifying these carbon benefits. The effect of vegetation treatment on the carbon content of natural and working lands over the long term—by reducing occurrences of high-severity wildfires and/or by increasing the carbon sequestration potential of vegetated landscapes—continues to be the focus of scientific research and model development. The current body of research presents a range of findings regarding the effects of vegetation treatments on the long-term carbon emissions or sequestration of vegetated lands. Though most of the research focuses on forested lands that have the potential to produce merchantable timber, a review of this research provides insights to vegetation communities in general, including the different vegetation communities on the Hill Campus. A review of the scientific literature in the *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan* indicates that, in a broader context, treatment activities reduce vegetation densities and fuel loads, restore the structure and composition of ecosystems, and may lower the potential for damaging, high-severity fire, which is currently the primary source of GHG emissions and carbon loss from the natural and working lands sector (Stephens et al. 2009; Hurteau et al. 2008; Hurteau and North 2009; and North et al. 2009—all cited in CalEPA et al. 2019:14). Additionally, the *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan* finds that future vegetative growth on treated acres would result in carbon sequestration over time. The *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan*, which includes treatment activities, relied on the California Natural and Working Lands Carbon and Greenhouse Gas Model (CALAND model) to evaluate the long-term effects of the draft plan.

The CALAND model is an empirically based landscape-scale carbon accounting model that assesses the projected GHG benefits of certain conservation, restoration, and management activities on California's natural and working lands. CALAND is designed to quantify the level of GHG emissions associated with treatments of different types of vegetation as well as the net change in carbon sequestration in vegetation and soils resulting from different types of treatments (Di Vittorio and Simmonds 2018:3). The technical documentation that supports the CALAND model suggests that strategies to reduce vegetation density, including prescribed burning and thinning, are likely to benefit regional forest health and help prevent large losses of carbon (Di Vittorio and Simmonds 2018:52), although more research is warranted to be able to definitively estimate carbon sequestration. It also suggests that, while fuel reduction treatment activities directly emit GHGs, they could also result in long-term carbon sequestration benefits and can affect vegetation carbon accumulation rates for a 20-year post-management period (Di Vittorio and Simmonds 2018). However, some key assumptions of CALAND about the carbon dynamics associated with the utilization of harvested and collected biomass carbon for wood products and energy would not apply to the WVFMP. Notably, CALAND assumes some treatments of forested lands would include the harvest of merchantable timber for the manufacture of wood products that continue to hold sequestered carbon over their useful life and then the eventual CO_2 and methane emissions associated with the decay of discarded wood products. This assumption would not be applicable to WVFMP treatments, because the WVFMP does not include harvest of merchantable timber. CALAND also assumes removal of 20 percent of live and dead standing trees for wood products and bioenergy resulting from "clearing of ladder fuels and debris through thinning" in forests (Di Vittorio and Simmonds 2018:12, 14, 20). Disposition of biomass created by the WVFMP treatments would differ from the CALAND assumptions (see Section 2.5.5 in Chapter 2, "Project Description").

Other studies address the reduction of GHG emissions from wildfire in treated areas in comparison to non-treated areas, based on the expectation that fires would be less intense in treated locations. Wildfires are especially emission-intensive because they are uncontrolled and can result in crown fires that burn entire trees. Wildfires on untreated lands are more difficult to control and suppress than wildfires on lands that have undergone vegetation treatments. One study determined that, in some forest classes that historically had relatively frequent fire intervals, wide-scale prescribed burn application can reduce GHG emissions from wildfires by 18–25 percent in the western U.S., and by as much as 60 percent in specific forest systems as compared to a wildfire on untreated lands (Wiedinmyer and Hurteau 2010). The classes of forests in which this relationship was found include mixed conifer, Douglas-fir/ponderosa pine, and ponderosa/Jeffrey pine—species not widely present on the Hill Campus. As discussed in Section 3.12, "Wildfire," there is a scientific consensus that there is a correlation between certain types of vegetative fuel treatments and reduced wildfire severity. Other studies suggest that reducing fuels through mechanical treatments and prescribed burning is effective at reducing fire severity and annual area burned when applied at the landscape scale over an extended period (Kim et al. 2013, Prichard and Kennedy 2014). Another study found that when moderate- and high-severity wildfires encountered a previously treated area, fire severity was substantially reduced in the treated area relative to the adjacent untreated area (Lydersen et al. 2017). The findings of these studies indicate that vegetation treatments may result in a net carbon benefit in the long term, particularly in the context of avoided GHG emissions from wildfire, the severity and extent of which would be less in treated areas, and/or the potential for treated areas to sequester more carbon.

Also, a modeling study by Hurteau and North (2009) suggests that the potential for treatments of a forest to result in a long-term increase in carbon sequestration is most affected by the stand structure, which generally refers to the distribution of trees by species and size, resulting from the fuel treatments (Hurteau and North 2009). There is limited research regarding the effects of fuel treatments on carbon emission and sequestration within shrub- and grass-dominated lands.

In short, there is uncertainty in predicting future wildfire occurrence, severity, and carbon sequestration rates that will continue to be evaluated in ongoing research and factored into future state-level planning for management of natural and working lands and in future iterations of the CALAND model and other models. As stated in the *2017 Scoping Plan*, continued research and development to advance the state of science on carbon dynamics is needed (CARB 2017a:82–83). The current scientific understanding of the carbon-related effects of vegetation treatments is limited, in part, because the long timescale in which these carbon cycles need to be considered. Depending on the vegetation community, an appropriate timescale is on the order of 20, 50, or 100 years, or longer. This is acknowledged in the *2017 Climate Change Scoping Plan 2017 Scoping Plan*, the *California Forest Carbon Plan*, and *California 2030 Natural and Working Lands Climate Change Implementation Plan*.

Summary

Average annual GHG emissions generated by initial treatment activity in the Plan Area would be approximately 1,061 $MTCO_2e$/year. However, in the absence of any applicable quantitative threshold to determine whether GHG emissions attributable to the WVFMP would directly or indirectly have a significant impact on the environment, the carbon balance of the Plan Area is considered, as well as consistency with applicable GHG reduction plans to determine whether a significant impact would occur. Implementation of the WVFMP would provide carbon benefits over the long term, including a reduction in the occurrence and severity of future GHG-emitting wildfires and carbon sequestration provided by the growth of native vegetation that is more fire resilient on treated acres. Thus, implementation of the WVFMP would be consistent with plans that address the carbon balance in natural and working lands that are part of state-wide mandates to achieve GHG reductions. While a quantitative method is not available to accurately calculate net carbon emissions, reduction and avoidance of larger wildfires is likely, based on the available information herein, to result in a long-term reduction in carbon emissions through ongoing carbon sequestration and less large-scale loss of carbon through catastrophic wildfire. Because implementation of the WVFMP would be consistent with plans that address the carbon balance in natural and working lands that are part of state-wide mandates to achieve GHG reductions, the emissions generated by these treatments would not be substantial, and would not result in a significant impact. Therefore, the impact of GHG emissions associated with treatment activities under the WVFMP would be **less than significant**.

Identified Treatment Projects (Project-level Analysis)

The estimated levels of GHG emissions associated with the Identified Treatment Projects that would be implemented in 2021 and 2022 are shown in Table 3.7-3. All of the Identified Treatment Projects in Table 3.7-3 would be subject to mechanical and/or manual treatments with potentially some follow-up herbicide application to prevent regrowth on tree stumps. Prescribed broadcast burning and pile burning would not occur, but most of the removed vegetation would be incinerated in the air curtain burner at the Richmond Field Station.

Table 3.7-3 Greenhouse Gas Emissions Generated by Identified Treatment Projects

Identified Treatment Project	Project Acreage	$MTCO_2e$[1]
East-West FB	22.0	90.0
Hearst Gate FB	1.2	5.2
TRA 1	0.1	0.41
TRA 2	0.7	2.9
TRA 3	0.7	2.9
TRA 4	0.0	0.0
Strawberry FHR	23.7	90.8
Claremont FHR	25.5	97.7
Frowning FHR	49.2	201
Total	**123.1**	**491**

Notes: $MTCO_2e$ = metric tons of carbon dioxide–equivalent

[1] For mechanical treatment and manual treatment, the emissions level includes emissions associated with hauling approximately 60 percent of vegetative debris to the UC Berkeley Richmond Field Station to be incinerated in an air curtain and 5 percent of the vegetative debris generated by mechanical and manual treatments would be burned in piles on site.

Source: See Appendix F for detailed calculations and assumptions.

As shown in Table 3.7-3 the combined level of GHG emissions associated with the Identified Treatment Projects would be approximately 491 $MTCO_2e$. As discussed in the program-level analysis for the overall WVFMP, the Identified Treatment Projects would provide carbon benefits over the long term associated with reduced occurrence and severity of wildfire emissions and future carbon sequestration by more fire resilient native vegetation established in treated areas. Thus, like the overall WVFMP, the Identified Treatment Projects would be consistent with plans that address the carbon balance in natural and working lands that are part of state-wide mandates to achieve GHG reductions, including the *2017 Climate Change Scoping Plan 2017 Scoping Plan*, the *California Forest Carbon Plan*, and *California 2030 Natural and Working Lands Climate Change Implementation Plan*. Because implementation of the Identified Treatment Projects would be consistent with plans that address the carbon balance in natural and working lands that are part of state-wide mandates to achieve GHG reductions, the emissions generated by these treatments would not be substantial, and would not result in a significant impact. Therefore, the impact of GHG emissions associated with implementation of the Identified Treatment Projects would be **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

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3.8 HAZARDS AND HAZARDOUS MATERIALS

This section evaluates potential health, safety, and environmental impacts related to hazards and hazardous materials that could result from implementation of the WVFMP. It describes existing potential hazards and safety concerns within the Plan Area and the nature of potential impacts that could occur as a result of the vegetation treatment activities.

Comments on the Notice of Preparation related to hazards and hazardous materials included the potential effects of herbicides to human health and the environment, including possible interactions between herbicides (i.e., synergistic effects) and potential effects from herbicide drift and burning of vegetation treated with herbicides. Refer to Appendix D for a summary of comments received on the Notice of Preparation. The potential effects to human health from the use of herbicides (including herbicide drift) are addressed in Section 3.8.3, "Impact Analysis and Mitigation Measures" below. Specific environmental protection measures (EPMs) that would be incorporated into treatment design to minimize risks associated herbicide use are described in Section 2.6 "Environmental Protection Measures." The potential for health effects due to burning vegetation previously treated with herbicides is addressed in Section 3.3, "Air Quality." The potential effects of herbicide use to biological resources and watercourses are addressed in Section 3.5, "Biological Resources," and Section 3.9, "Hydrology and Water Quality." The potential indirect and direct exposure of people and structures to wildland fires is addressed in Section 3.12, "Wildfire." The potential for synergistic effects and specific analysis related to each herbicide proposed for use is presented in Appendix G, "Herbicide Risk Assessment."

3.8.1 Environmental Setting

Hazards include conditions that could potentially affect health and safety. Examples include exposure to hazardous materials, such as chemicals or hazardous waste, or to physically hazardous situations, such as those that may occur in areas of high wildfire risk or in proximity to airports. Hazardous materials are defined, and potential hazards are summarized below. Because the nature of existing potential hazards do not differ between the overall Plan Area and the boundaries of the Identified Treatment Projects, the environmental setting described below is applicable to both.

HAZARDOUS MATERIALS

Definitions

California Health and Safety Code Section 25501 defines *hazardous materials* as any material that, because of its 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 into the workplace or the environment. Hazardous materials include, but are not limited to, hazardous substances, hazardous waste, and any material that a handler or the administering 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.

A *hazardous chemical* is any chemical whose presence or use poses a physical or health hazard. The Federal Occupational Safety and Health Administration (OSHA) Laboratory Standard defines it as a chemical for which there is significant evidence, based on at least one study conducted in accordance with established scientific principles, that it may cause acute or chronic health effects to exposed employees. The term *health hazard* includes chemicals that are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins (affecting the liver), nephrotoxins (affecting kidneys), neurotoxins (affecting brain and nervous system), agents that affect the hematopoietic (blood) system, and agents that damage lungs, skin, eyes, or mucous membranes.

Existing Hazardous Materials Use

During the course of daily operations, UC Berkeley staff use hazardous materials within the Hill Campus. Hazardous materials include chemical reagents, solvents, fuels, paints, and cleansers that are used in activities such as laboratory research, building and grounds maintenance, and vehicle maintenance. Other hazardous materials, including radioactive and biohazardous materials, are also used in laboratory research facilities adjacent to the Plan Area (i.e., at LBNL, as discussed below). Use of hazardous materials also generates hazardous byproducts that are handled and disposed of as hazardous waste.

As described in Section 2.4, "Past and Current Vegetation Treatments," UC Berkeley implements an ongoing program of vegetation treatment and maintenance activities in the Plan Area to reduce wildfire risk. These activities entail the use of vehicles and equipment that require the use of common hazardous materials such as fuels, oils, and lubricants. Herbicides are also currently used in the Plan Area in small quantities using hand-held application devices; herbicide use is described in more detail below.

Cortese List

In California, regulatory databases listing hazardous materials sites provided by numerous federal, state, and local agencies are consolidated in the "Cortese List" pursuant to Government Code Section 65962.5. Cortese List sites can be queried using the California Department of Toxic Substances Control's (DTSC) EnviroStor database and the State Water Resource Control Board's (SWRCB) GeoTracker database. The DTSC EnviroStor database includes federal and state response sites, voluntary, school, and military cleanups and corrective actions, and permitted sites. The SWRCB GeoTracker database includes leaking underground storage tanks (LUSTs); permitted underground storage tanks; and spills, leaks, investigations, and cleanup database sites. The lists and databases cited above identify sites with suspected and confirmed releases of hazardous materials to the subsurface soil and/or groundwater. The statuses of these sites change as identification, monitoring and clean-up of hazardous materials progress. Typically, a site is closed once it has been demonstrated that existing site uses combined with the levels of identified contamination on-site present no significant risk to human health or the environment.

These lists and databases were reviewed to identify any facilities or sites identified as meeting the "Cortese List" requirements within the Plan Area. The Plan Area does not contain known LUST sites (SWRCB 2020). However, LBNL, which is outside of and adjacent to the Plan Area, is permitted to operate a Hazardous Waste Handling Facility (HWHF) where hazardous and mixed waste treatment and storage take place. The HWHF is situated in the eastern portion of LBNL and comprises Building 85 and its associated yard area. LBNL is listed as cleanup site under corrective action and the DTSC Cleanup Program provides oversight of ongoing cleanup activities onsite (DTSC 2019a, 2019b).

Herbicides

Background Information

Pesticides are chemicals that are used to kill plants, fungus, bacteria, insects, and other pests and their use is controlled by several regulations, which are described in detail in Section 3.8.2, "Regulatory Setting," below. Herbicides are a type of pesticide that are used to selectively control specific types of vegetation or to non-selectively to clear all vegetation on a particular area. Although UC Berkeley would only use herbicides, because herbicides are a type of pesticide, the discussion of pesticides in this document also applies to the use of herbicides and the terms are used interchangeably.

The process of registering a pesticide (including herbicides) is a scientific, legal, and administrative procedure through which the U.S. Environmental Protection Agency (EPA) examines:

- the ingredients of the pesticide;
- the particular site or crop where it is to be used;
- the amount, frequency, and timing of its use; and
- storage and disposal practices.

In evaluating a pesticide registration application, EPA assesses a wide variety of potential human health and environmental effects associated with use of the product. The company that is seeking EPA-registration for the pesticide must provide data from studies that comply with EPA testing guidelines. EPA then develops risk assessments that evaluate the potential for (1) harm to humans, wildlife, fish, and plants, including endangered species and non-target organisms, and (2) contamination of surface or ground water from leaching, runoff, and spray drift (EPA 2018a). Risk assessment is crucial to the process of making decisions about pesticides, both new and existing. New pesticides must be evaluated before they can be used, and existing pesticides must be re-evaluated periodically to check that they continue to meet the appropriate safety standards (EPA 2017a). The EPA also evaluates and approves the language that appears on each pesticide label to ensure the directions for use and safety measures are appropriate to address potential risks. Following label directions is required by law and is necessary to ensure safe use (EPA 2018a).

The EPA and individual states register and license pesticides in the U.S. under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). California state laws that regulate herbicide use, which are enforced by the California Department of Pesticide Regulation (DPR), are more restrictive than federal regulations and most other states. For example, pre-registration and registration requirements in California are more stringent than in other parts of the U.S. DPR reviews the studies submitted to the EPA and evaluates their findings, as well as state laws, to determine if additional label requirements or studies are needed. Applicable regulations governing pesticide use are described in Section 3.8.2, "Regulatory Setting."

Current Herbicide Use

As described in Chapter 2, "Project Description," UC Berkeley currently uses small quantities of herbicides, which are applied by hand to prevent the growth or regrowth of exotic plants, such as eucalyptus, Monterey pine, and French broom seedlings, in the Plan Area. UC Berkeley has used glyphosate, imazapyr, triclopyr, and clopyralid to treat vegetation within the Plan Area (FEMA 2014). All herbicide application complies with UC requirements, EPA label directions, as well as CalEPA and DPR label standards. Herbicide applicators are required to wear personal protective equipment (PPE) during applications and possess a valid license or certificate from the California DPR or receive appropriate training and/or direct supervision by a Pesticide Control Advisor (PCA).

As described in Chapter 2, "Project Description," the UC President has established specific requirements for the use of herbicides that are classified as Tier 1/high hazard by the UC Task Force. As of early 2020, Tier 1/high hazard herbicides cannot be used without prior approval by the UC's Integrated Pest Management Committee (IPMC) and all approved uses must adhere to more stringent regulations than what is currently required by state law. Glyphosate and Garlon have been designated Tier 1 and therefore cannot be used without prior approval by the IPMC.

Human Health Risks and Toxicity

As with all potentially toxic substances, whether exposure to a herbicide causes harm depends on the dose, how someone is exposed, how sensitive an individual may be to the toxin, and the toxicity of the herbicide involved. People can be exposed to herbicides in three ways: breathing it in (inhalation exposure), getting it in the mouth or digestive tract (oral exposure), and contact with the skin or eyes (dermal exposure). Inhalation exposure can happen if someone breathes air containing herbicide as a vapor, as an aerosol, or on small particles like dust. Oral exposure happens when someone eats food or drinks water containing herbicides. Dermal exposure happens when someone's skin or eyes is exposed to herbicides. This exposure can cause irritation or burns. In more serious cases, skin can absorb the herbicide into the body, causing other adverse health effects. Some herbicides evaporate more easily than others, so they are more likely to be inhaled. Some break down quickly on surfaces; others last longer. Herbicide applied as a liquid spray may drift more easily than dry granules, depending on meteorological conditions. A dry herbicide plowed into the soil can encounter groundwater but is not as likely to drift through the air. All these factors affect the potential risk of human exposure and are considered in DPR rules for pesticide use (DPR 2014).

Sensitive Receptors

Herbicides affect different people in different ways. Children may be more sensitive to some herbicides than adults. Compared to adults, they breathe in more air and eat more food relative to their body size, increasing their exposure. Also, their developing bodies may not break down some chemicals as effectively as adults. People of any age with asthma or other chronic diseases may be more likely than healthy individuals to get sick after herbicide exposure. Some individuals are also more sensitive to the odor or other irritant effects of certain herbicides. However, people in the greatest danger of harm from herbicide exposure are those whose exposure is highest, such as workers who mix or apply herbicides (DPR 2014).

Potential sensitive receptors in the vicinity of the Plan Area include UC Berkeley and LBNL staff working in nearby facilities; hikers, runners and dog walkers that may use the fire trails within the UC Berkeley Hill Campus; and residents that are located adjacent to the Plan Area. The nearest residences are located directly northwest of the Plan Area approximately 600 feet north of the Lawrence Hall of Science building, and southwest of the Plan Area near and along Panoramic Way. Figure 3.10-1 in Section 3.10, "Noise," shows these residential areas in proximity to the Plan Area.

Accelerants

Accelerants are fuels and other chemicals (e.g., gelling agents) that are used in tools for igniting prescribed burns. Drip torches, which are handheld ignition devices that use a fuel/gasoline mixture, are the primary ignition tool for prescribed burns. When accelerants are oxidized during the burning process, new chemicals may be formed; however, many of these are gaseous or particulate chemicals that are quickly dispersed and diluted in the open air. It is possible that some solid or liquid residues may remain on the soil after accelerants are used to start a prescribed burn (USFS 2002).

3.8.2 Regulatory Setting

The regulations identified below are applicable at the program and project level, unless otherwise noted.

FEDERAL

The EPA is the agency primarily responsible for enforcement and implementation of federal laws and regulations pertaining to hazardous materials. Relevant federal regulations pertaining to hazardous materials are contained mainly in Code of Federal Regulations (CFR) Titles 29, 40, and 49. Hazardous materials, as defined in the CFR, are listed in 49 CFR Section 172.101. Management of hazardous materials is governed by the following laws:

- Resource Conservation and Recovery Act (RCRA) of 1976 (42 U.S. Code [USC] Section 6901 et seq.);
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, also called the Superfund Act) (42 USC Section 9601 et seq.); and
- Superfund Amendments and Reauthorization Act (SARA) of 1986 (Public Law 99-499).

These laws and associated regulations include specific requirements for facilities that generate, use, store, treat, and/or dispose of hazardous materials, which are applicable primarily to the WVFMP's use of herbicides. The EPA provides oversight and supervision for federal Superfund investigation/remediation projects, evaluates remediation technologies, and develops hazardous materials disposal restrictions and treatment standards.

Resource Conservation and Recovery Act

RCRA establishes a framework for national programs to achieve environmentally sound management of both hazardous and non-hazardous wastes. RCRA was designed to protect human health and the environment, reduce/eliminate the generation of hazardous waste, and conserve energy and natural resources. RCRA also promotes resource recovery techniques. A waste would legally be considered hazardous if it is classified as ignitable, corrosive, reactive, or toxic. Under RCRA, the EPA regulates hazardous waste from the time that the waste is generated until its final disposal ("cradle to grave"). The Hazardous and Solid Waste Amendments of 1984 both expanded the scope of RCRA and increased the level of detail in many of its provisions. The Hazardous Waste Management subchapter of the RCRA deals with a variety of issues regarding the management of hazardous materials, including the export of hazardous waste, state programs, inspections of hazardous waste disposal facilities, enforcement, and the identification and listing of hazardous waste. Under RCRA regulations, commercial chemical products such as herbicides would become "solid wastes" (and thus, potentially, hazardous wastes) at the point where UC Berkeley decides to discard them, if the herbicide product is listed in 40 CFR 261.31 or 261.33, or exhibits a hazardous waste characteristic identified in 40 CFR 261.21 through 261.24 (Cornell University 2017).

Comprehensive Environmental Response, Compensation, and Liability Act and Superfund Amendments and Reauthorization Act

Hazardous substances are a subclass of hazardous materials. They are regulated under the CERCLA and SARA. Under CERCLA, the EPA has authority to seek out the parties responsible for releases of hazardous substances and ensure their cooperation in site remediation. CERCLA also provides federal funding (the "Superfund") for remediation. SARA Title III, the Emergency Planning and Community Right-to-Know Act (EPCRA), requires companies to declare potential toxic hazards to ensure that local communities plan ahead for chemical emergencies. The EPA maintains a National Priority List of uncontrolled or abandoned hazardous waste sites identified for priority remediation under the Superfund program. The EPA also maintains the Comprehensive Environmental Response, Compensation, and Liability Information System database that contains information on hazardous waste sites, potentially hazardous waste sites, and remedial activities across the nation.

For releases of hazardous substances, the federal government has established Superfund Reportable Quantities (RQs). CERCLA would apply to the WVFMP if a hazardous materials release were to occur during treatment activities above an established RQ for the substance.

Emergency Planning Community Right-To-Know Act

EPCRA was included under the SARA law and is commonly referred to as SARA Title III. EPCRA was passed in response to concerns regarding the environmental and safety hazards posed by the storage and handling of toxic chemicals. EPCRA establishes requirements for federal, state and local governments, Indian tribes, and industry regarding emergency planning and "Community Right-to-Know" reporting on hazardous and toxic chemicals. SARA Title III requires states and local emergency planning groups to develop community emergency response plans for protection from a list of extremely hazardous substances (40 CFR Section 355 Appendix A). The Community Right-to-Know provisions help increase the public's knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment. In California, SARA Title III is implemented through the California Accidental Release Prevention Program.

Some commonly used herbicides are included in the SARA Title III List of Extremely Hazardous Substances. This list identifies Threshold Planning Quantities (TPQs) and RQs for each extremely hazardous substance. The TPQ is the amount of a substance in pounds in your possession at any one time that is at or above the listed quantity of active ingredients. Once this amount or more is in a person's possession, it must be reported within 60 days according to Sara Title III requirements (University of Missouri 2019). Of the herbicides proposed for use, only trifluralin is included on the SARA Title III List of Extremely Hazardous Substances. Thus, EPCRA would apply to the WVFMP if trifluralin is proposed for use at or above its established TPQs, or is released above the established RQ for the substance.

Occupational Health and Safety Administration

Enacted in 1970, the Occupational Safety and Health Act established this agency to ensure healthy working conditions in the U.S. There are approximately 2,100 OSHA inspectors, who, along with other experts and support staff, establish and enforce protective standards in the workplace. California, under an agreement with OSHA, operates an occupational safety and health program in accordance with Section 18 of the Occupational Safety and Health Act of 1970. The program applies to all public and private sector places of employment in the state, with the exception of federal employees, the U.S. Postal Service, private sector employers on Native American lands, maritime activities on the navigable waterways of the U.S., private contractors working on land designated as exclusive Federal jurisdiction, and employers that require Federal security clearances.

The OSHA Hazard Communication Standard (29 CFR Section 1910.1200) requires that workers be informed of the hazards associated with the materials they handle. For instance, manufacturers must appropriately label containers, Material Safety Data Sheets must be available in the workplace, and employers must properly train workers. Workers at hazardous waste sites must receive specialized training and medical supervision according to the Hazardous Waste Operations and Emergency Response regulations (29 CFR Section 1910.120).

Implementation of treatments under the WVFMP would require compliance with these federal and state safety standards and practices regarding workplace safety and providing a safe and healthy environment for workers.

Federal Insecticide, Fungicide, and Rodenticides Act

FIFRA provides the basis for regulation, sale, distribution, and use of pesticides in the United States. FIFRA authorizes the EPA to review and register pesticides for specified uses. The EPA also has the authority to suspend or cancel the registration of a pesticide if subsequent information shows that continued use would pose unreasonable risks. FIFRA has been amended by the Pesticide Registration Improvement Act of 2003, which provides for the enhanced review of covered pesticide products, to authorize fees for certain pesticide products, and to extend and improve the collection of maintenance fees.

As a part of the federal registration process, the EPA classifies each pesticide product as a "general use pesticide" or "restricted use pesticide" (RUP) based on the potential for the product to cause unreasonable adverse effects on human health or the environment. Only certified pesticide applicators or those under the supervision of a certified pesticide applicator may use a RUP. Certification is a statement by the certifying agency that the applicator is competent and authorized to use or supervise the use of restricted pesticides (EPA 2018b).

Individuals applying any type of pesticide must do so consistent with this federal law as well as state and tribal laws and regulations. In general, states have the primary authority within the state for compliance monitoring and enforcement for the use of pesticides in violation of labeling requirements. The equivalent regulations at the state level are described below in under "State." FIFRA requirements, as enforced by the state (such as adhering to herbicide labels and application instructions), would apply to the use of herbicides under the WVFMP.

Worker Protection Standard

The EPA oversees pesticide use through the Worker Protection Standard (WPS). The WPS is a regulation for agricultural pesticides which is aimed at reducing the risk of pesticide poisonings and injuries among agricultural workers and pesticide handlers. WPS protects employees on farms, forests, nurseries, and greenhouses from occupational exposure to agricultural pesticides. The WPS contains requirements for pesticide safety training, notification of pesticide applications, use of PPE, restricted-entry intervals after pesticide application, decontamination supplies, and emergency medical assistance. The regulation covers two types of workers:

- Pesticide handlers: those who mix, load, or apply agricultural pesticides; clean or repair pesticide application equipment; or assist with the application of pesticides in any way.
- Agricultural workers: those who perform tasks related to the cultivation and harvesting of plants on farms or in greenhouses, nurseries, or forests.

The WPS requirements would apply to herbicide use proposed under the WVFMP to protect the health and welfare of herbicide handlers and appliers.

U.S. Department of Transportation

The U.S. Department of Transportation (DOT), in conjunction with the EPA, is responsible for enforcement and implementation of federal laws and regulations pertaining to the transportation of hazardous materials. The Hazardous Materials Transportation Act of 1974 (49 U.S. Code 5101 et seq.) directs the DOT to establish criteria and regulations regarding safe storage and transportation of hazardous materials. Hazardous materials regulations are contained in 49 CFR 171–180, and address transportation of hazardous materials, types of materials defined as hazardous, and the marking of vehicles transporting hazardous materials. In particular, 49 CFR 173, titled "Shippers' General Requirements for Shipments and Packaging," defines hazardous materials for transportation purposes; within this portion of the code, 49 CFR 173.3 provides specific packaging requirements for shipment of hazardous materials, and 49 CFR 173.21 lists categories of materials and packages that are forbidden for shipping. 49 CFR 177, titled "Carriage by Public Highway," defines unacceptable hazardous materials shipments.

The DOT Pipeline and Hazardous Materials Safety Administration has designated many chemical compounds, including some herbicides, as hazardous materials. Compliance with DOT Regulation 49 CFR 100-185 would be required for the transport of triclopyr and trifluralin under the WVFMP.

STATE

The Safe Drinking Water and Toxic Enforcement Act

The Safe Drinking Water and Toxic Enforcement Act (Proposition 65), passed as a ballot initiative in 1986, requires the state to annually publish a list of chemicals known to the state to cause cancer or reproductive toxicity so that the public and workers are informed about exposures to potentially harmful compounds. CalEPA's Office of Environmental Health Hazard Assessment (OEHHA) administers the act and evaluates additions of new substances to the list. Proposition 65 requires companies to notify the public about chemicals in the products they sell or release into the environment, such as through warning labels on products or signs in affected areas and prohibits them from knowingly releasing significant amounts of listed chemicals into drinking water sources. For pesticide use in a workplace setting, Proposition 65 requirements are met through compliance with DPR regulations, further described below under "California Pesticide Regulatory Program." Glyphosate and oryzalin are the only chemicals proposed for use under the WVFMP that have been listed under Proposition 65 in California by the OEHHA. Glyphosate was listed via the "Labor Code" listing mechanism, based on the International Agency for Research and Cancer's (IARC) classification of glyphosate as *probably carcinogenic to humans* (Group 2A) in 2015. Oryzalin was listed via the "Authoritative Bodies" listing mechanism based on an EPA report that classified oryzalin as "likely to be carcinogenic to humans" (OEHHA 2020). Refer to additional information on these chemicals presented in Table 3.8-1 and Appendix G.

California Hazardous Waste Control Act

The California Hazardous Waste Control Act (HWCA) regulates the generation, treatment, storage, and disposal of hazardous waste (California Health and Safety Code Section 2510 et seq.). Hazardous waste is any material or substance that is discarded, relinquished, disposed of, or burned, or for which there is no intended use or reuse, and the material or substance causes or significantly contributes to an increase in mortality or illness; or the material or substance poses a substantial present or potential hazard to human health or the environment. These materials or substances include spent solvents and paints (oil and latex), used oil, used oil filters, used acids and corrosives, and unwanted or expired products (e.g., herbicides, aerosol cans, cleaners). If the original material or substance is labeled Danger, Warning, Toxic, Caution, Poison, Flammable, Corrosive or Reactive, the waste is very likely to be hazardous. The HWCA would apply to any WVFMP activities that require storage or disposal of hazardous waste (primarily herbicides).

California Pesticide Regulatory Program

DPR regulates the sale and use of pesticides in California. DPR is responsible for reviewing the toxic effects of pesticide formulations and determining whether a pesticide is suitable for use in California through a registration process. Although DPR cannot require manufacturers to make changes in labels, it can refuse to register products in California unless manufacturers address unmitigated hazards by amending the pesticide label. Consequently, many pesticide labels that are already approved by the EPA also contain California-specific requirements. Pesticide labels defining the registered applications and uses of a chemical are mandated by the EPA as a condition of registration. The label includes instructions telling users how to make sure the product is applied only to intended target pests and includes precautions the applicator should take to protect human health and the environment. For example, product labels may contain such measures as restrictions in certain land uses and weather (i.e., wind speed) parameters.

DPR also designates pesticides that can impair human health or pose hazards to the environment as "restricted materials" (similar to RUPs classification by EPA). Pesticides designated as restricted materials (state or federal) have additional use requirements which may include some or all of the following: (1) applicator certification from DPR or the applicable county agricultural commissioners (CAC), (2) enhanced supervision requirements for uncertified applicators, (3) a restricted materials permit from the CAC, and (4) additional requirements established by regulation. DPR usually designates restricted materials on the basis of active ingredient, concentration, container size, or use patterns on the labeling. The goal is to allow determination of the status by examining the product container and its labeling (DPR 2018).

Title 3, California Code of Regulations (CCR) section 6450, et. seq. further restricts the use of certain pesticides or active ingredients. These restrictions apply to all pesticide applications approved through the restricted materials permit process (through the applicable CAC). Regulatory restrictions may include the amount of pesticide that can be applied;

methods of application; where the pesticide can be applied; or additional PPE that must be worn or used. The permit application process provides CACs with the opportunity to discuss the additional use restrictions with the property operator or pest control business well in advance of the actual application. Unlike permit conditions that are established by the CAC, regulatory use requirements are state regulations and are not attached to the permit (DPR 2018).

All herbicide use under the WVFMP would be required to comply with DPR regulations, such as adhering to herbicide labels and application directions and wearing PPE. None of the herbicides proposed for use under the WVFMP are designated as 'restricted materials' by DPR.

California Department of Toxic Substances Control

DTSC, a division of the CalEPA, has primary regulatory responsibility over hazardous materials in California, working in conjunction with the EPA to enforce and implement hazardous materials laws and regulations. DTSC can delegate enforcement responsibilities to local jurisdictions.

The hazardous waste management program enforced by DTSC was created by the HWCA (California Health and Safety Code Section 25100 et seq.), which is implemented by regulations described in the CCR Title 26. The state program is similar to, but more stringent than, the federal program under RCRA. The regulations list materials that may be hazardous and establish criteria for their identification, packaging, and disposal.

Environmental health standards for management of hazardous waste are contained in CCR Title 22, Division 4.5. In addition, as required by California Government Code Section 65962.5, DTSC maintains a Hazardous Waste and Substances Site List for the state, commonly called the Cortese List.

California's Secretary for Environmental Protection has established a unified hazardous waste and hazardous materials management regulatory program (Unified Program) as required by Senate Bill 1082 (1993). The Unified Program consolidates, coordinates, and makes consistent the administrative requirements, permits, inspections, and enforcement activities for the following environmental programs:

- hazardous waste generator and hazardous waste onsite treatment programs;
- Underground Storage Tank program;
- hazardous materials release response plans and inventories;
- California Accidental Release Prevention Program;
- Aboveground Petroleum Storage Act requirements for spill prevention, control, and countermeasure plans; and
- California Uniform Fire Code hazardous material management plans and inventories.

The six environmental programs within the Unified Program are implemented at the local level by local agencies—Certified Unified Program Agencies. Certified Unified Program Agencies carry out the responsibilities previously handled by approximately 1,300 State and local agencies, providing a central permitting and regulatory agency for permits, reporting, and compliance enforcement.

DTSC regulations would be applicable to the WVFMP if herbicides or other substances proposed for use qualify as a hazardous substance (some herbicides become hazardous waste when discarded and, accordingly, must be disposed of as a hazardous waste).

California Division of Occupational Health and Safety Administration

The California Division of Occupational Safety and Health Administration (Cal/OSHA), assumes primary responsibility for developing and enforcing workplace safety regulations within the state. Cal/OSHA standards are more stringent than federal OSHA regulations and are presented in CCR Title 8. Standards for workers dealing with hazardous materials include practices for all industries (General Industry Safety Orders); specific practices are described for construction, and hazardous waste operations and emergency response. Cal/OSHA conducts on-site evaluations and issues notices of violation to enforce necessary improvements to health and safety practices. Among other requirements, Cal/OSHA requires many entities to prepare Injury and Illness Prevention Plans and Chemical Hygiene Plans and provides specific regulation to limit exposure of construction workers to lead.

Implementation of treatments under the WVFMP would require compliance with the Cal/OSHA safety standards and practices regarding workplace safety and providing a safe and healthy environment for workers.

California Air Resources Board

The California Air Resources Board (CARB) oversees California's Smoke Management Program, which addresses potentially harmful smoke impacts from agricultural, forest, and range land management burning operations. The legal basis of the program is found in the *Title 17 Smoke Management Guidelines for Agricultural and Prescribed Burning,* adopted by CARB on March 23, 2000 (CARB 2011). The Guidelines state that each air district or region shall adopt, implement, and enforce a smoke management program, in coordination with CARB and other appropriate stakeholders. Elements of the program include permitting requirements for agricultural and prescribed burns, meteorological and smoke management forecasting, and a daily burn authorization system (CARB 2000). The *California Wildfire Smoke Response Coordination*, prepared under the auspices of CARB's California Air Response Planning Agency and the California Interagency and Smoke Council, provides useful information and resources seeking assistance in protecting the public's health from the impacts of smoke during wildfires (CARPA 2014). This program is discussed in more detail in Section 3.3, "Air Quality" and would be applicable to prescribed burning under the WVFMP.

State Water Resources Control Board and Regional Water Quality Control Boards

SWRCB and nine regional water quality control boards (RWQCBs) are responsible for ensuring implementation and compliance with the provisions of the federal Clean Water Act and the state Porter-Cologne Act. The Porter-Cologne Act of 1969 is California's statutory authority for the protection of water quality. Along with the SWRCB and RWQCBs, water quality protection is the responsibility of numerous water supply and wastewater management agencies, as well as city and county governments, and requires the coordinated efforts of these various entities. These entities and water quality protection are discussed in more detail in Section 3.9, "Hydrology and Water Quality," and would be applicable to any treatment activities under the WVFMP that could directly or indirectly affect water quality.

LOCAL

As a constitutionally-created state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies. Following the relevant policies of the UC Berkeley 2020 LRDP, relevant local regulations are summarized below.

UC Berkeley 2020 LRDP

The UC Berkeley 2020 LRDP contains the following policy related to hazards that is applicable to the WVFMP (UC Berkeley 2005):

- Manage the Hill Campus landscape to reduce fire and flood risk and restore native vegetation and hydrology patterns.

UC Berkeley Office of Environment, Health, and Safety

UC Berkeley's Office of Environment, Health and Safety's (EH&S) Hazardous Materials Management Team is responsible for developing hazardous material management procedures, providing orientation and training to campus personnel, picking up and processing unwanted hazardous material and waste, and coordinating the proper disposal of waste and redistribution of reusable material. Specific programs provide for management of chemical, radioactive, controlled substance, and "medical" wastes generated by the campus. EH&S is also responsible for pollution prevention programs, campus wide hazardous waste minimization efforts, hazardous material release response planning, the Chemical Inventory Program, and hazardous material shipping. EH&S prepares Hazardous Materials Business Plans (HMBP) that include inventories of hazardous materials handled on campus, emergency response plans, and training programs in safety procedures and emergency response. The HMBP is updated and submitted to the City of Berkeley Toxics Management Division annually (UC Berkeley 2018).

Alameda County General Plan

The Safety Element of the Alameda County General Plan contains the following goals and policies related to hazards and hazardous materials that are applicable to the WVFMP (Alameda County 2014):

GOAL 4: Minimize residents' exposure to the harmful effects of hazardous materials and waste.

- **Policy 1:** Uses involving the manufacture, use or storage of highly flammable (or toxic) materials and highly water reactive materials should be located at an adequate distance from other uses and should be regulated to minimize the risk of onsite and offsite personal injury and property damage. The transport of highly flammable materials by rail, truck, or pipeline should be regulated and monitored to minimize risk to adjoining uses.
- **Policy 6**: Adequate separation shall be provided between areas where hazardous materials are present and sensitive uses such as schools, residences and public facilities.

Contra Costa County General Plan

The Safety Element of the Contra Costa County General Plan contains the following goals and policies related to hazards and hazardous materials that are applicable to the WVFMP (Contra Costa County 2010):

GOAL 10-I: To provide public protection from hazards associated with the use, transport, treatment and disposal of hazardous substances.

- **Policy 10-61:** Hazardous waste releases from both private companies and from public agencies shall be identified and eliminated.
- **Policy 10-62**: Storage of hazardous materials and wastes shall be strictly regulated.
- **Policy 10-63**: Secondary containment and periodic examination shall be required for all storage of toxic materials.

City of Berkeley General Plan

The City of Berkeley General Plan Disaster Preparedness and Safety Element and Environmental Management Element contain the following goals and policies related to hazards and hazardous materials that are applicable to the WVFMP (City of Berkeley 2003):

- **Policy S-22 Fire Fighting Infrastructure**: Reduce fire hazard risks in existing developed areas.
- **Policy EM-7 Reduced Wastes:** Continue to reduce solid and hazardous wastes.
- **Policy EM-14 Hazardous Material Regulation:** Control and regulate the use, storage and transportation of toxic, explosive, and other hazardous and extremely hazardous material to prevent unauthorized and accidental discharges.

City of Oakland General Plan

The Safety Element of the City of Oakland General Plan contains the following policies related to hazards and hazardous materials that are applicable to the WVFMP (City of Oakland 2004).

- **Policy FI-3**: Prioritize the reduction of the wildfire hazard, with an emphasis on prevention.
- **Policy HM-1**: Minimize the potential risks to human and environmental health and safety associated with the past and present use, handling, storage and disposal of hazardous materials.

3.8.3 Impact Analysis and Mitigation Measures

ANALYSIS METHODOLOGY

The analysis of impacts related to hazards and hazardous materials focuses on the potential for the creation of significant hazards to the public or environment through the routine use of hazardous materials or reasonably foreseeable upset and accident conditions involving hazardous materials, emissions of hazardous materials within one quarter mile of a school, activities to be located on a hazardous materials site or near an airport, interference with an adopted emergency response plan, or exposure of persons to significant injury, loss, or death due to wildfire. Significance determinations account for the influence of relevant EPMs, which are incorporated into treatment design; the full text of EPMs is presented in Section 2.6 "Environmental Protection Measures."

SIGNIFICANCE CRITERIA

An impact related to hazards and hazardous materials is considered significant if implementation of the WVFMP would:

- create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials into the environment;
- emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;
- be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment;
- for a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area;
- implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; and/or
- expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires.

ISSUES NOT EVALUATED FURTHER

The following issues are not evaluated further in the EIR for the reasons summarized below. Refer to the Initial Study in Appendix C of this EIR for additional explanation.

The Plan Area does not contain any sites which are included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 (SWRCB 2020). LBNL, which is outside of and adjacent to the Plan Area, is listed as cleanup site under corrective action (DTSC 2019a, 2019b). Implementation of the WVFMP would not disrupt areas within LBNL or otherwise expose the public or environment to hazardous materials sites. This issue is not discussed further in this EIR.

The Plan Area is not located within an airport land use plan or within two miles of a public airport. The nearest airport is the Oakland International Airport located approximately 10 miles southeast of the Plan Area. Therefore, the WVFMP would not expose people working in the Plan Area to safety hazards or excessive noise levels from airport activities. This issue is not discussed further in this EIR.

Implementation of the WVFMP would not alter potential emergency evacuation routes or impair an adopted emergency plan, as no alterations to public roadways would occur and treatment activities would be temporary and occur off road and in vegetated areas. While there may be disruptions to some local roadways and access points when vegetation treatments are being implemented, these disruptions would be temporary (e.g., when heavy equipment is in use) and implemented for the protection of the public; access would return to existing conditions once the activity is complete. In addition, UC Berkeley would coordinate with adjacent facilities and local fire departments to plan alternate emergency access in the Plan Area during vegetation treatments that may cause temporary road closures, as discussed in Chapter 2, "Project Description." Furthermore, Implementation of proposed evacuation support treatments would improve emergency access and evacuation within the Plan Area. Thus, the

WVFMP would not have any significant impacts on adopted emergency response or emergency evacuation plans. This issue is not discussed further in this EIR.

The Plan Area is entirely within the UC Berkeley campus, which is an existing school. There are no substantial differences between the potential effects to the school community or to the general public. Thus, potential hazards and hazardous waste impacts to nearby schools are not discussed separately, rather they are incorporated into Impact HAZ-1 and Impact HAZ-2 below.

As stated in the introduction to this section, the potential indirect and direct exposure of people and structures to wildland fires is addressed in Section 3.12, "Wildfire."

IMPACT ANALYSIS

Impact HAZ-1: Create a Significant Health Hazard from the Use or Accidental Release of Hazardous Materials

Treatment activities proposed under the WVFMP would require the use of equipment and vehicles, which need fuels, oils, and lubricants to operate. The use, transport, and disposal of these substances could result in an accidental release of these hazardous substances into the environment should any leaks or spills occur. EPMs HAZ-1 and HYD-1 require that all equipment be inspected for leaks before the start of treatment activities and fuels, heavy equipment, and other potentially hazardous materials to be kept at a sufficient distance from water courses to provide protection from accidental leaks or spills. These EPMs would minimize leaks and the potential for any leaked substances or spills to enter the environment. Furthermore, UC Berkeley would comply with applicable federal and state laws that regulate the use, transport, storage, and disposal of hazardous materials, including the HWCA, DTSC's Unified Program, and OSHA and EPA regulations. Although implementation of the WVFMP would increase the amount of treatment activities within the Plan Area and thus increase the use of common hazardous materials in the Plan Area, with implementation of EPMs and adherence to relevant regulations, no significant hazards would be created from the use or accidental release of hazardous materials under the overall WVFMP at both the program- and project-level. This impact would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects.

<u>Overall WVFMP (Program-level Analysis)</u>

Implementation of manual vegetation treatment, mechanical vegetation treatment, and prescribed burning under the WVFMP would require the transportation, use, and storage of hazardous materials such as fuels, oils, and lubricants. Managed herbivory would use livestock and thus would not use hazardous materials, except from vehicle use during livestock transport. Because these treatment activities would involve similar types of hazardous materials and result in similar impacts, they are discussed together below. Herbicide application is discussed under Impact HAZ-2.

Treatment activities implemented under the WVFMP would use mechanical equipment and vehicles, such as chainsaws, masticators, tractors, and large trucks, which need fuels, oils, and lubricants to operate. These types of substances are considered common hazardous materials and can adversely impact human health or the environment if released in large quantities. In addition, UC Berkeley would use hand-held ignition devices to ignite prescribed burns, such as drip torches, which use a gasoline/diesel fuel mixture. The use of fuels and other common hazardous materials could result in an accidental release of these hazardous substances into the environment should any leaks or spills occur.

Although some treatment activities proposed under the WVFMP would occur on or adjacent to public roads and trails, road and trail closures would occur as necessary during active treatments to protect public safety. Equipment and vehicles would be fueled, lubricated, and serviced at fueling stations and repair facilities, which would minimize the potential to release large quantities of these substances into the environment. In addition, EPM HAZ-1 would be incorporated into WVFMP implementation, which requires that all equipment be inspected for leaks before the start of treatment activities and everyday thereafter until equipment is removed from a treatment site; and any equipment found leaking is required to be promptly removed. This EPM would minimize leaks and the risk of resultant contamination from entering the environment. EPM HYD-1 would also be implemented, which requires fuels, heavy equipment, and other potentially hazardous materials to be kept at a sufficient distance from water courses to provide protection from accidental leaks or spills. If a leak or spill should occur, this EPM would minimize impacts to water quality and the potential for further transport of contaminants. Furthermore, UC Berkeley would comply with the federal and state laws described in Section 3.8.2, "Regulatory Setting" that regulate the use, transport, storage, and disposal of hazardous materials to minimize potential health risks, including the HWCA, DTSC's Unified Program, and OSHA and EPA regulations. In addition, these types of common hazardous materials proposed for use under the WVFMP are currently in use under existing conditions within the Plan Area.

Although implementation of the WVFMP would increase the number of treatment activities occurring within the Plan Area and thus increase the use of common hazardous materials in the Plan Area, with implementation of EPMs and adherence to relevant regulations, no new or more severe significant hazards would be created from the use or accidental release of hazardous materials under the WVFMP. This impact would be **less than significant**.

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. Thus, potential health hazards from the use or accidental release of hazardous materials to operate equipment and vehicles would be the same as described above for the overall WVFMP and this impact would be **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

Impact HAZ-2: Create a Significant Health Hazard from the Use or Accidental Release of Herbicides

Herbicide application under the WVFMP would require increased transportation, use, storage, and disposal of various herbicides, which could result in risks to workers handling the herbicides and to the public (i.e., residents adjacent to treatment areas or recreationists using trails within the Plan Area). Under normal conditions, compliance with all laws, regulations, and herbicide label instructions, along with proper PPE, would prevent significant risks related to human exposure to herbicides. However, potentially adverse effects could occur if an accidental release were to occur or if herbicides were to drift to non-target areas. Several EPMs would be incorporated into the WVFMP to further minimize the potential for accidental release and off-site drift and associated health risks (EPM HAZ-2 through HAZ-6). None of the herbicides proposed for use were found to pose significant risks to applicators or the public based on documented adverse laboratory and field effects to target and non-target organisms after an exposure to a compound given the application techniques and safety precautions included in the WVFMP (refer to Appendix G for additional information). Therefore, implementation of the overall WVFMP and the Identified Treatment Projects would not result in significant increase in health hazards from the use or accidental release of herbicides. This impact would be **less than significant**.

This analysis focuses on the potential for herbicides proposed use under the WVFMP to create significant risks to human health. The potential for herbicide application under the WVFMP to affect non-target vegetation, wildlife, and water quality is discussed in Section 3.5, "Biological Resources" and Section 3.9, "Hydrology and Water Quality."

Overall WVFMP (Program-level Analysis)

Herbicides proposed for use under the WVFMP include Garlon 4 Ultra (triclopyr), Stalker (imazapyr), Transline (clopyralid), Glyphosate-based products, Snapshot 2.5TG (isoxaben and trifluralin), and Surflan AS (oryzalin). As discussed in Section 3.8.1, "Environmental Setting," UC Berkeley has used limited quantities of glyphosate, imazapyr, triclopyr, and clopyralid within or near the Plan Area. Thus, the WVFMP would result in the introduction of three new herbicides (isoxaben, trifluralin, and oryzalin) as well as an increase in herbicide application within the Plan Area. This would result in increased transportation, use, storage, and disposal of various herbicides, as well as the potential for accidental release.

Workers who mix, load, transport, and apply herbicides are normally considered to have the greatest potential for exposure because of the nature of their work and are therefore at highest risk. Worker exposure to pesticides can occur from accidental splashes or spills of chemicals, leakages, or faulty spraying equipment. The potential for worker exposure increases if that person does not follow the instructions on how to use the herbicide, not use proper PPE, or neglects to wash hands after pesticide handling or before eating. Exposure of the general population to herbicides occurs mainly through eating food and drinking water contaminated with herbicides, or when living close to a location where herbicides are used (Damalas and Eleftherohorinos 2011). Under the WVFMP, herbicides would only be applied by hand directly to target vegetation, which would minimize the amount of herbicides that would be used and geographic area to which herbicides would be applied. There is no food production occurring in the Plan Area; therefore, public exposure through food consumption would not occur. In addition, as described in Section 3.9, "Hydrology and Water Quality," groundwater percolation within the Plan Area is limited, and none of the groundwater resources present in the Plan Area are used for domestic water supply; thus, public exposure through drinking water contamination would not occur. Although herbicide application under the WVFMP would be highly targeted, the potential exists for herbicides to drift to non-target areas during high winds, which could result in a health hazard for residents adjacent to the Plan Area or recreationists using trails within the Plan Area. In addition, applicators could be exposed while handling herbicides during treatments implemented under the WVFMP, or if a large spill were to occur.

As discussed above under Section 3.8.2, "Regulatory Setting," the U.S. DOT, in conjunction with the EPA, is responsible for enforcement and implementation of federal laws and regulations pertaining to the transportation of hazardous materials. The EPA oversees pesticide use and health and safety through the WPS. The WPS is a regulation for pesticides and herbicides which is aimed at reducing the risk of pesticide poisonings and injuries among workers and pesticide handlers. The WPS contains requirements for pesticide safety training, notification of pesticide applications, use of PPE, restricted-entry intervals after pesticide application, decontamination supplies, and emergency medical assistance. In addition, Cal/OSHA promulgates safety standards and practices regarding workplace safety and providing a safe and healthy environment for workers, and the California Pesticide Regulatory Program regulates the sale and use of pesticides in California. DPR is responsible for reviewing the toxic effects of pesticide formulations and determining whether a pesticide is suitable for use in California through a registration process. The label includes instructions telling users how to make sure the product is applied only to intended target pests and includes precautions the applicator should take to protect human health and the environment. These include weather parameters including wind speed to avoid drift and precipitation to minimize unintended runoff. RCRA, HWCA, and the DTSC include regulations applicable to the packaging, storage, and disposal of specific hazardous materials.

Some pesticides and herbicides become hazardous waste when discarded and, accordingly, must be disposed of as a hazardous waste. UC Berkeley would adhere to all of the required regulations and label instructions (EPM HAZ-3), which would minimize risks to workers and herbicide handlers as well as to the public. In addition, as discussed in Section 3.8.1, "Environmental Setting," the UC President has established specific requirements for herbicides that are classified as Tier 1/high hazard by the UC Task Force. Because glyphosate and triclopyr have been designated as Tier 1/high hazard, they cannot be used without approval from the UC's IPMC. If approved for use, all approved uses must adhere to more stringent regulations than what is currently required by state law. Compliance with all laws, regulations, and herbicide label instructions, along with use of proper PPE, would prevent significant risks related to human exposure to herbicides.

EPM HAZ-2 and HAZ-4 through HAZ-6 have also been incorporated into the WVFMP to further minimize the potential for human exposure and potential health risks from herbicide use under the WVFMP. These EPMs require UC Berkeley or the licensed PCA to prepare a SPRP before beginning herbicide treatment activities to prevent spills and have a planned response should one occur (EPM HAZ-2); triple rinsing of herbicide and adjuvant containers with clean water at an approved site and dispose of rinsate per 3 CCR Section 6684 and dispose of all herbicides following label requirements and waste disposal regulations (EPM HAZ-4); employ techniques during herbicide application to minimize drift, such as prohibiting spray applications when winds exceed 7mph and configuring spray nozzles to produce the largest droplet size (EPM HAZ-5); and include informational signage at each pedestrian entry point before and at least 24 hours after herbicide application (EPM HAZ-6). These EPMs, in combination with the multiple regulations governing the use of pesticides, would minimize risks to the public and workers from herbicide use under the WVFMP.

To further examine the potential for impacts to human health and the environment from the herbicides proposed for use under the WVFMP, an Herbicide Risk Assessment was prepared for the WVFMP (presented in Appendix G). As described in Appendix G of this EIR, the evaluation of a herbicide’s risk to human health is based on toxicity of the herbicide and possible methods of exposure. This is a standard method used to provide an estimated risk of chemicals to humans. Herbicide toxicity is determined by the documented adverse laboratory and field effects to target and non-target organisms after an exposure to a compound. Exposure describes the specific amount of the compound that reaches an organism’s tissues (i.e., the dose) as well as the duration of time over which the dose is received. Several other factors are involved in exposure, such as the target tissue or physiological function affected and the sensitivity of the organism of interest to the compound. Even highly hazardous chemicals can have little risk if the potential exposure is minimal.

Table 3.8-1 provides an overview of the herbicides proposed for use, the formulation and common name of each, and potential for human toxicity if direct and/or prolonged exposure were to occur. All data reported for estimates of human toxicity are generally based on extrapolations of laboratory animal studies and are overly conservative (e.g., the doses used in these studies are far higher than the enforced legal pesticide limits) to assure that adverse effects are not underestimated. Since 1986, the EPA has produced carcinogen risk assessment guidelines to assist with hazard identification of carcinogens. Human data, animal data, and supporting evidence are combined to characterize the weight-of-evidence (WOE) regarding a chemical agent’s potential as a human carcinogen. The current guidelines, finalized in 2005, recommend expressing WOE using the general categories of 1) Carcinogenic to Humans, 2) Likely to be Carcinogenic to Humans, 3) Suggestive Evidence of Carcinogenic Potential, 4) Inadequate Information to Assess Carcinogenic Potential, and 5) Not Likely to be Carcinogenic to Humans. Under the 1986 guidelines, this WOE was summarized as fitting one of several hierarchic categories:

- Group A - Carcinogenic to Humans: Agents with adequate human data to demonstrate the causal association of the agent with human cancer (typically epidemiologic data).
- Group B - Probably Carcinogenic to Humans: Agents with sufficient evidence (i.e., indicative of a causal relationship) from animal bioassay data, but either limited human evidence (i.e., indicative of a possible causal relationship, but not exclusive of alternative explanations; Group B1), or with little or no human data (Group B2).
- Group C - Possibly Carcinogenic to Humans: Agents with limited animal evidence and little or no human data.
- Group D - Not Classifiable as to Human Carcinogenicity: Agents without adequate data either to support or refute human carcinogenicity.
- Group E - Evidence of Non-carcinogenicity for Humans: Agents that show no evidence for carcinogenicity in at least two adequate animal tests in different species or in both adequate epidemiologic and animal studies (EPA 2017b).

Table 3.8-1 presents the carcinogen risk assessment category label for each herbicide proposed for use under the WVFMP, specified by the most recent assessment of each compound, which may be via the current or 1986 guidelines. Refer to Appendix G for detailed evaluations of each compound proposed for use under the WVFMP, including methods of transport and their potential to cause significant harm to humans and ecological resources.

Table 3.8-1 Human Toxicity of Chemicals Proposed for Use under the WVFMP

Chemical	Formulation	Potential Human Toxicity
Triclopyr (Garlon 4)	triclopyr amine	Low toxicity to humans if ingested, but may cause skin irritation, eye irritation, and respiratory irritation at high doses and exposures. Prolonged skin contact is unlikely to result in absorption of harmful amounts. No adverse effects are anticipated from single ingestion exposure. The EPA has classified triclopyr as a Group D chemical that is not classifiable as to human carcinogenicity. Triclopyr has not been shown to be an endocrine disruptor.
Imazapyr (Stalker)	2-[4,5- dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid	Practically non-toxic after ingestion. No reports of effects on mammalian reproduction. The chronic risk for mammals is low following all exposure routes to imazapyr. No evidence of carcinogenicity, neurotoxicity, or immunotoxicity after exposures to Imazapyr.
Clopyralid (Transline) (Lontrel) (Cody) (Alligare) (Confront) (Thistledown)	Monoethanolamine salt 3,6-dichloro-pyridinecarboxylic acid	Very low toxicity if ingested. Clopyralid is classified by the EPA as "not likely to be carcinogenic to humans." There are some indications of potential birth defects in laboratory animal studies at very high doses; however, no birth defects observed in animals given clopyralid at doses several times greater than those expected during normal exposure. Clopyralid is not listed as mutagenic.
Glyphosate (Roundup) (Roundup Pro) (RoundupProMax)	Isopropylamine salt, potassium salt, dimethylamine salt & diammonium salt	Very low toxicity via oral and dermal routes. Skin and eye irritation possible. No evidence of neurotoxicity, immunotoxicity, or acute toxicity. Reproductive toxicity may occur at very high doses. Recent claims of carcinogenicity (class 2A) were based on animal studies. Substantial evidence finds human carcinogenicity unlikely. Some studies suggest that glyphosate may be a possible endocrine-disruptor.[1]
Isoxaben (Snapshot 2.5 TG)	Benzamide, N-[3-1-ethyl- 1-methy propyl)-5- isoxazoly l]-2,6-dimethoxy	Oral toxicity is categorized as very low. No adverse effects have been reported for inhalation, but there is potential for minor skin irritation from dust exposure. There are no reports of eye irritation or contact allergy. It has been classified as a Group C, possible human carcinogen by the EPA. This classification is used when there is limited or uncertain information indicating that a chemical may cause cancer in animals receiving high doses of the chemical.
Trifluralin (Snapshot 2.5 TG)	2,6-Dinitro-N,N-dipropyl-4-(trifluoromethyl)aniline	Oral toxicity is categorized as very low. No adverse effects have been reported for inhalation, but there is potential for minor skin irritation from dust exposure. There are no reports of eye irritation or contact allergy. The EPA has classified triclopyr as a Group D chemical that is not classifiable as to human carcinogenicity.
Oryzalin (Surflan AS)	Benzenesulfonamide, 4-(Dipropylamino)-3,5-Dinitro	Moderate dermal and inhalation acute toxicity, practically non-toxic by the oral route. Carcinogenic in some animal studies and has been classified as a Group C, possible human carcinogen by the EPA.

Notes: EPA = U.S. Environmental Protection Agency. [1] There have been court cases involving Roundup and the juries in these cases have awarded several million dollars to plaintiffs. Although glyphosate has been listed under Proposition 65 based on the International Agency for Research and Cancer's (IARC) classification of glyphosate as probably carcinogenic (based on one study in mice), decades of actual laboratory and field testing of glyphosate conclude that glyphosate is not likely to be carcinogenic to humans and no other meaningful risks to human health occur when the product is used according to the label. Recent expert panels have been convened to directly evaluate the claims of the IARC that glyphosate is carcinogenic to humans. Reports of these panels strongly counter that claim and indicate there is insufficient evidence that glyphosate is carcinogenic. Refer to Appendix G for more detailed information regarding glyphosate and human health risks.

Source: Adapted by Ascent Environmental from Appendix G of this EIR; see citations therein.

As shown in Table 3.8-1, most of the herbicides proposed for use under the WVFMP pose low levels of potential toxicity to humans, although some can result in skin and eye irritation or can be slightly toxic if high levels of exposure occurs. The toxicity evaluations provided are conservatively based on animal studies where laboratory animals are directly exposed to these chemicals. None of the herbicides proposed for use were found to pose significant risks to applicators or the public based on application techniques and safety precautions included in the WVFMP (Appendix G).

Pursuant to the EPMs and existing laws and regulations, herbicides would be applied under the guidance of licensed and certified PCAs and according to label requirements; storage, loading and mixing would be conducted according to specifications that would protect against spills or accidental release of chemicals into the environment; UC Berkeley or the licensed PCA would prepare a SPRP before beginning any herbicide treatment activities to provide direction in the event of an accidental release and protect onsite workers, the public, and the environment from accidental leaks or spills of herbicides, adjuvants, or other potential contaminants; cleanup and disposal of containers would be conducted according to guidelines that prevent contamination; and all appropriate laws and regulations pertaining to the use of herbicides and safety standards for employees and the public, as governed by the EPA and DPR, would be followed. Furthermore, ceasing application when weather parameters exceed label specifications or when sustained winds at the site of application exceeds 7 miles per hour (whichever is more conservative), and using properly configured spray nozzles, would prevent herbicides from drifting into non target areas, such as adjacent residential areas. Notifying the public before and following application of herbicides would allow the public to avoid areas where herbicide application is occurring or has recently occurred, if so desired. Together, implementation of EPMs and compliance with regulatory requirements would minimize health hazards from herbicide application and the potential for accidental release of herbicides. Therefore, the impact associated with use or accidental release of herbicides to human health under the overall WVFMP would be **less than significant**.

Identified Treatment Projects (Project-level Analysis)

All of the Identified Treatment Projects would involve varying levels of herbicide use consistent with the methods described for the overall WVFMP. The same regulations and EPMs to reduce risks to public health and safety as described for the overall WVFMP would apply to the Identified Treatment Projects. Thus, potential health risks from the use of herbicides and the potential for accidental release of herbicides for the Identified Treatment Projects would be the same as described above for the overall WVFMP and this impact would be **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

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3.9 HYDROLOGY AND WATER QUALITY

This section evaluates the potential for implementation of the WVFMP to affect hydrologic resources and water quality, including flooding, drainage, groundwater recharge, and water quality. Mitigation measures are recommended as necessary to reduce significant hydrologic and water quality impacts. This section also identifies and characterizes existing hydrologic resources in the Plan Area and summarizes relevant federal, state, and local regulations. Hydrologic resources include surface waters and groundwater.

Comments on the Notice of Preparation related to hydrology and water quality requested that the analysis consider the potential for Plan implementation to cause erosion and the potential for herbicide treatments to impact water quality. These issues are addressed in Section 3.9.3, "Impact Analysis and Mitigation Measures," below.

3.9.1 Environmental Setting

OVERALL WVFMP

Climate and Topography

Due to the marine influences of San Francisco Bay, the climate around UC Berkeley is temperate with fairly small daily and seasonal temperature changes. The area is generally cool and foggy in the winter and hot and dry in the summer. Average annual rainfall in the Plan Area is 23 inches, with more than 90 percent of this precipitation occurring between November and April (City of Berkeley 2011). Most of the Plan Area is composed of hilly or steep terrain. More than 75 percent of the Plan Area has a slope greater than 40 percent, and more than 90 percent of the Plan Area has a slope greater than 20 percent (UC Berkeley 2004). Elevations in the Plan Area range from approximately 400 feet above sea level at its western edge to nearly 1,800 feet above sea level at Chaparral Peak at its eastern edge (City of Berkeley 2011).

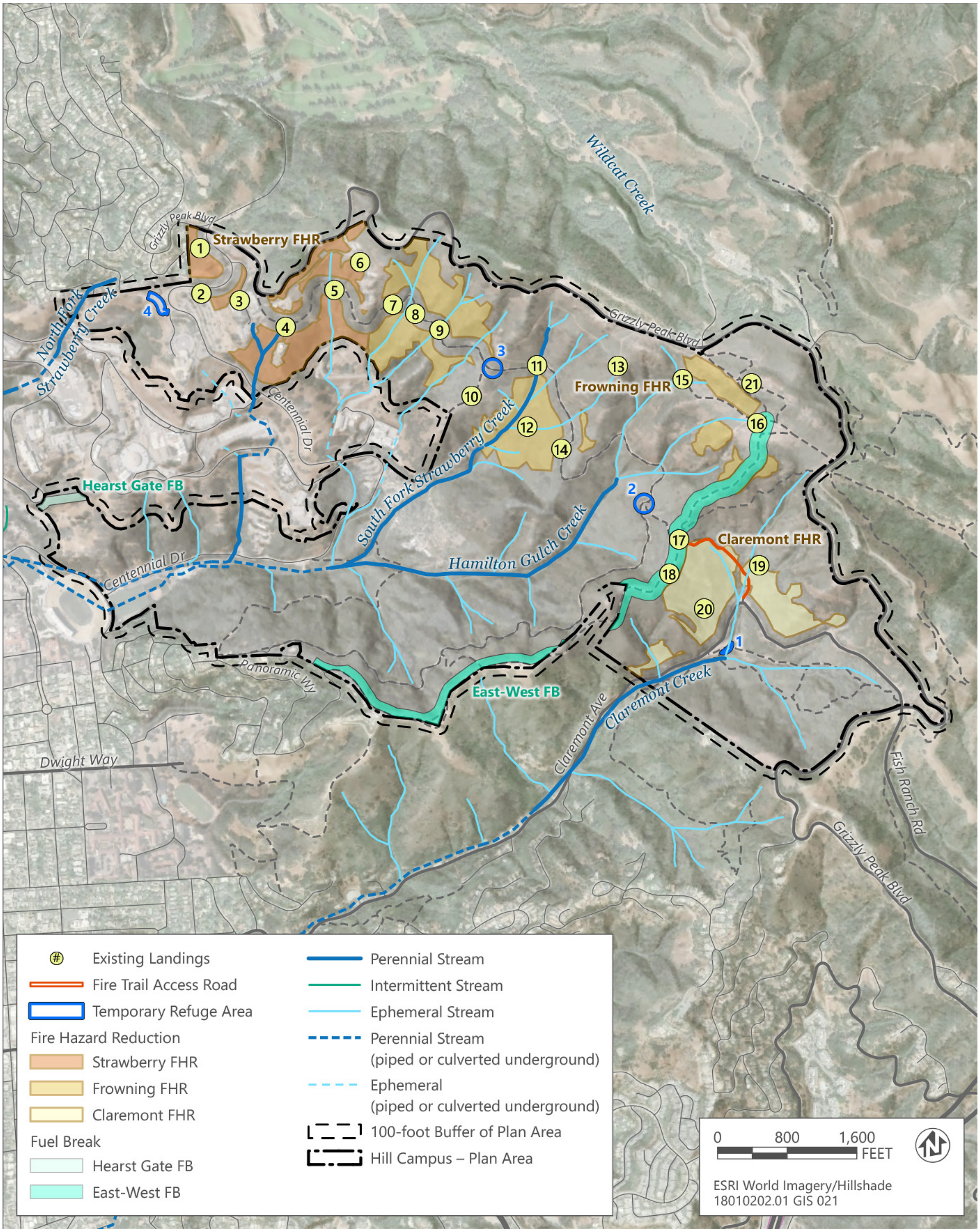
Hydrologic Resources

<u>Surface Waters</u>

Surface waters occur as streams, lakes, ponds, coastal waters, lagoons, and estuaries, or are found in floodplains, dry lakes, desert washes, wetlands and other collection sites. Water bodies modified or developed by humans, including reservoirs and aqueducts, are also considered surface waters. Surface water resources are influenced by tectonics, topography, geology/soils, climate, precipitation, and hydrologic conditions. The Plan Area is characterized by ephemeral and intermittent tributaries, as well as perennial streams.

Watersheds are defined as the area of land where water collects and drains into a common outlet. Geologic structures and topography are the main factors that affect the size, shape, and location of watersheds because water flows from high to low elevations. The watersheds in the vicinity of the Plan Area drain in a westerly direction. Thus, water starting in the high-elevation Berkeley Hills moves across the more gently sloping Bay alluvial plain before discharging into San Francisco Bay. The Plan Area lies within two Basins: Strawberry and Temescal Basins. The natural creek systems as well as culverts and storm drains within these basins act as the drainage system for the Plan Area. Figure 3.9-1 shows hydrologic features that define the Plan Area and the surrounding area.

The northern portion of the Plan Area is located within Strawberry Basin, which has a total drainage area of 1,977 acres and generates approximately 2,482 acre-feet of runoff annually (City of Berkeley 2011). The entire Basin runs from the East Bay Hills to the San Francisco Bay, covering four distinct levels of physical development: minimal development in the hills, which includes most of the Plan Area; light development in areas such as Lawrence Berkeley National Laboratory (LBNL); medium development in areas such as the UC Berkeley Campus Park; and heavy development within the City of Berkeley. Strawberry Creek is the main hydrologic resource in the basin and is composed of a north and south fork, which converge at the western edge of the Campus Park. After the convergence, water flows into one of three on-campus natural retention basins that regulate downstream flooding.



Source: data downloaded from University of California, Berkeley in 2019 and SFEI in 2017

Figure 3.9-1 Local Hydrology

After release from these retention basins, water flow is diverted into mostly underground culverts and is discharged into San Francisco Bay south of the Berkeley Marina (UC Berkeley 2007). As shown in Figure 3.9-1, the majority of the Plan Area within this basin drains to the south fork of Strawberry Creek, and a small portion of the north part of the Plan Area drains to the north fork of Strawberry Creek.

The north fork of Strawberry Creek is a perennial creek that begins in the Hill Campus to the north of LBNL. The creek crosses LBNL by following Blackberry Canyon and passes through a series of check dams and settlement basins before entering culverts that drain into the Bay. Some intermittent and ephemeral tributary drainages contribute to the north fork, as well as flows from hydraugers, which are pipes inserted horizontally into a hillside to drain excessive groundwater from the soil (UC Berkeley 2007).

The south fork of Strawberry Creek is a perennial creek that begins in the eastern end of Strawberry Canyon. The majority of the watershed consists of undeveloped, steep canyons and hillsides. The creek flows west from the hills and into a stormwater detention pond next to Haas Pavilion to help control downstream flooding. This detention pond has an estimated flood storage capacity of 11 million gallons, and downstream flow rates are controlled by hydraulically operated gates at the western side of the detention basin. From the detention pond, water is diverted into 36-inch and 48-inch diameter concrete pipes before re-emerging briefly as a surface stream in the Campus Park (UC Berkeley 2007). Many intermittent and ephemeral tributary drainages contribute to the south fork, including the perennial Chicken Creek, among others. Hamilton Creek, located in Hamilton Gulch, is the main perennial tributary to the south fork and drains a large portion of the central Plan Area.

The southeastern portion of the Plan Area is located within Temescal Basin, which has a total drainage area of 4,324 acres and generates approximately 3,386 acre-feet of runoff annually (City of Berkeley 2011). Claremont Creek, also known as Harwood Creek, is a perennial creek and the main hydrologic resource for Temescal Basin located within the Plan Area. The creek is diverted into a culvert above the Claremont Hotel and remains mostly underground before discharging into San Francisco Bay (Alameda County 2017). Claremont Creek does not drain into Lake Temescal, an artificial water body historically used as a city reservoir, but currently used as a recreation area for swimming, picnicking, and fishing (Alameda County 2017).

Surface Water Runoff

Surface water runoff is affected by many factors including slope gradient, ground surface permeability, soil depth, land use, vegetation type and quantity, and rainfall amount, intensity, and duration. Steep slopes and less permeable ground surfaces tend to generate high levels of runoff, while land with high vegetation cover and/or mild slopes tend to generate low levels of runoff. Soil type and depth influences runoff because coarser and deeper soils are able to absorb water faster and have a greater retention capacity. Therefore, sandy soils are most efficient at reducing runoff compared to fine-grained silty or clay soils.

The Maymen and similar soil series make up approximately 80 percent of the Plan Area. These are shallow soils over impervious shale in very steep terrain (30-75 percent slopes) and have very rapid runoff and high erosion potential. The remaining 20 percent of the Plan Area is made up of deep, highly permeable soils (e.g. Altamont clay, Gilroy clay loam). Soils are discussed further in Section 3.6, "Geology and Soils." Areas in the Plan Area that have impervious surfaces such as buildings (i.e. Lawrence Hall of Science, Space Sciences Laboratory), paved roads (i.e. segments of Centennial Drive and Claremont Avenue), and other paved surfaces are likely to generate greater runoff volume and velocity.

Groundwater Hydrology

The replenishing of groundwater supplies is called groundwater recharge and occurs more readily in areas underlain by coarse sediments, where water is better able to infiltrate through the soil. Groundwater recharge does not occur easily in most sections of the Plan Area due to the area's steep slopes and abundance of Maymen soils that generate high levels of runoff as opposed to infiltration. Because of the Hill Campus' erosion potential, the campus has installed hydraugers to facilitate hillside drainage and minimize saturation of steep slopes (UC Berkeley 2007).

Groundwater levels vary and are influenced by a variety of factors including time of year, soil type, geologic seepage barriers, and faults. In some cases, groundwater supplies contribute to summer flows of creeks when precipitation is scarce. The Plan Area is located within the East Bay Plain groundwater basin according to the San Francisco Regional

Water Quality Control Board (RWQCB). The Plan Area contains abundant groundwater resources because the Hayward fault blocks westward water movement from the Hill Campus. However, none of these groundwater resources are used for domestic water supply (UC Berkeley 2004).

Water Quality

Water quality degradation of surface waters occurs through nonpoint- and point-source discharges of pollutants. Nonpoint-source pollution is defined as not having a discrete or discernible source and is generated from land runoff, precipitation, atmospheric deposition, seepage, and hydrologic modification (EPA 1993). Nonpoint-source pollution includes runoff containing pesticides, insecticides, and herbicides from agricultural areas and residential areas; acid drainage from inactive mines; bacteria and nutrients from septic systems and livestock; volatile organic compounds (VOCs) and toxic chemicals from urban runoff and industrial discharges; sediment from poor road construction, improperly managed construction sites, and agricultural areas; and deposition of pollutants from the atmosphere and modification of hydrologic flow patterns. In comparison, point-source pollution is generated from identifiable, confined, and discrete sources, such as a smokestack, sewer, pipe, culvert, or ditch. These pollutant sources are regulated by the U.S. Environmental Protection Agency (EPA) and State Water Resources Control Board (SWRCB) through the California RWQCBs. Many of the pollutants discharged from point-sources are the same as for nonpoint-sources, including municipal (bacteria and nutrients), agricultural (pesticides, herbicides, and insecticides), and industrial pollutants (VOCs and other toxic effluent).

Groundwater pollution or contamination is caused by (1) naturally occurring or synthesized chemicals that are discharged onto the land surface and percolate through to groundwater resources below, (2) flow into groundwater reservoirs through improperly sealed well casings, (3) leaking underground storage tanks, and (4) failed underground pipelines. Unintended backflow into wells can also occur when plumbing and pumping systems are not properly protected against backflow. Many of the sources of pollution and their toxic constituents are similar to those associated with surface water pollution. The most common groundwater pollutants are generated from nonpoint sources of salt, nitrite, pesticides, industrial effluent, and pathogens.

Sediment is considered a major pollutant according to the EPA and the SWRCB and is a key total maximum daily load (TMDL) constituent that determines impairment and Clean Water Act (CWA) Section 303(d) listing of impaired water bodies in a number of watersheds and river basins. High sediment loads are detrimental to beneficial water uses and aquatic habitat used by plant, amphibian and fish communities. Sedimentation is a result of erosion and the transport of eroded fine materials to a watercourse or waterbody and could result in increased turbidity, elevated levels of total dissolved solids and total suspended solids. Erosion is influenced by a variety of factors including geology and soil characteristics, topography, climate, and land use practices, among others. Erosion and sedimentation are natural phenomena but are greatly influenced by land management practices and land disturbance activities. Wildfires can result in increased erosion and sedimentation for a variety of reasons. Wildfires can burn away ground cover and vegetation, leaving soils exposed to erosion. In some circumstances, fires can also create hydrophobic soils, which temporarily seal the soil surface and prevent stormwater infiltration. This can cause increased runoff moving at greater runoff speeds that can erode more sediment more quickly.

In general, naturally occurring erosion and sedimentation results from weathering of bedrock or saturation of soils in erosion prone areas causing landslides, earthflows, debris flows, and other mass wasting-related processes; lateral channel migration resulting in bank erosion; channel downcutting and incision; and surface erosion cause by precipitation, runoff and wind on bare soil surfaces. Sporadically occurring natural events, such as flooding caused by heavy and prolonged precipitation and rain events following soon after wildfire, can generate high levels of sedimentation and erosion. In addition, heavy precipitation in a recently burned area can quickly lead to oversaturated and unstable soils, increasing the risk of landslide, earthflows, and debris flows. Some human activities that can result in accelerated erosion and sedimentation include road building, construction activities, agriculture (including some timber harvesting) and grazing, and recreation. Agriculture, mining, and other land disturbing activities that result in bare soil areas, can be prone to higher levels of surface runoff. Increased runoff can result in sheet, rill, and gully erosion, and landslides.

San Francisco Bay

Water quality in the San Francisco Bay has been degraded by a variety of historical and ongoing industrial, urban, and agricultural activities and their associated discharges to surface and groundwaters both from the San Francisco region and runoff from the Sacramento and San Joaquin river basins. Accordingly, it has been listed on the CWA Section 303(d) list as impaired for a variety of pollutants (EPA 2010). Efforts are currently underway to address high levels of pesticides, selenium, and mercury, and low levels of dissolved oxygen. Pollutants in the estuary can create toxic and reproductive effects for species at the bottom of the food chain as well as the fish and birds that eat them. Pollutants, such as mercury, also accumulate in the tissues of some fish popular for human consumption, creating a health hazard for those who eat them. Additional discussion of water quality in the San Francisco Bay and remediation efforts are included below in Section 3.9.2, "Regulatory Setting."

Creeks Within the Plan Area

The water quality in Strawberry Creek was so poor by the 1980s due to urbanization-related contamination that UC Berkeley was prompted to create the Strawberry Creek Management Plan in 1987. The plan led to a rapid rerouting of pipes that originally drained sewage into the creek and the development of better policies for regulating the dumping of waste into the creek. Within only two years of the plan's adoption, the water quality improved dramatically, and native fish returned to the creek. The current water quality of Strawberry Creek is considered good, with the greatest threats to water quality being shock-loading from polluted urban stormwater runoff and trash, and spills such as sewage leaks (UC Berkeley 2006). UC Berkeley currently has an MS4 NPDES Permit for stormwater and wastewater and the Strawberry Creek Environmental Quality Committee provides guidance to UC Berkeley regarding creek issues such as water pollution, erosion control, and restoration (UC Berkeley 2004). Strawberry Creek was listed on the Category 5 CWA Section 303(d) list in 2010 due to trash from illegal dumping and urban runoff. A TMDL is required and should be completed by 2021 (EPA 2010).

The portions of Strawberry Creek, Hamilton Creek, and Claremont Creek watersheds within the Plan Area are dominated by natural and undeveloped landscapes. Therefore, these portions of these creeks are less affected by urban runoff than sections farther west, outside the Plan Area (UC Berkeley 2006). Existing land uses in the Plan Area that contribute to existing water quality conditions include vegetation management activities similar to those proposed in the WVFMP, including mechanical and manual vegetation removal and prescribed burning. Goats have also been used to manage the grasslands and shrublands in the Plan Area since the 1980s, and UC Berkeley currently uses small quantities of herbicides applied by hand to prevent the growth or regrowth of exotic plants such as eucalyptus, Monterey pine, and French broom seedlings in the Plan Area. Additionally, the Plan Area includes a network of roads and trails that are used by recreationists and dog walkers. The low background levels of erosion and pollutant generation caused by these existing uses is reflected in the current water quality of Strawberry and Claremont Creeks, both of which have been identified as having beneficial uses by the San Francisco RWQCB (SF RWQCB 2017).

IDENTIFIED TREATMENT PROJECTS

The water resources located closest to each Identified Treatment Project are shown in Figure 3.9-1 and described in Table 3.9-1. Some Identified Treatment Projects may involve work within 50 feet of a waterway, but any work within this distance would be conducted using manual (hand-held) equipment. None of the Identified Treatment Projects would involve prescribed burning or managed herbivory.

Table 3.9-1 Surface Water Resources and the Identified Treatment Projects

Identified Treatment Project	Proposed Activities	Nearest Watercourse(s)	Nearest Watercourse Type	Distance to Nearest Watercourse (feet)
East-West FB	Manual, mechanical, herbicide use	Tributary to Hamilton Creek	Ephemeral	100
		Tributary to Claremont Creek	Ephemeral	80
Hearst Gate FB	Manual, herbicide use	Tributary to South Fork Strawberry Creek	Intermittent	345
TRA 1	Manual, mechanical, herbicide use	Claremont Creek	Perennial	15
		Tributary to Claremont Creek	Ephemeral	0
TRA 2	Manual, mechanical, herbicide use	Tributary to Hamilton Creek	Ephemeral	300
TRA 3	Manual, mechanical, herbicide use	Tributary to South Fork Strawberry Creek	Ephemeral	200
TRA 4	Manual, mechanical, herbicide use	North Fork Strawberry Creek	Perennial	440
Strawberry FHR	Mechanical, herbicide use	Chicken Creek and other tributaries to South Fork Strawberry Creek	Perennial and Ephemeral	0
Claremont FHR	Mechanical, herbicide use	Claremont Creek	Perennial	110
		Tributaries to Claremont Creek	Ephemeral	0
Frowning FHR	Manual, mechanical, herbicide use	Tributaries to Hamilton Creek and South Fork Strawberry Creek	Ephemeral	0
		South Fork Strawberry Creek	Perennial	0
		Tributary to Claremont Creek	Ephemeral	270

Notes: FB = fuel break, FHR = fuel hazard reduction, TRA = temporary refuge area. Numbers are rounded to the nearest tenth.
Source: Adapted by Ascent Environmental 2020.

3.9.2 Regulatory Setting

The regulations identified below are applicable at the program and project level, unless otherwise noted.

FEDERAL

Clean Water Act

The CWA consists of the Federal Water Pollution Control Act of 1972 and subsequent amendments. The CWA provides for the restoration and maintenance of the physical, chemical, and biological integrity of the nation's waters. The following CWA policies are applicable to implementation of the WVFMP.

Water Quality Criteria/Standards

Pursuant to federal law, the EPA has published water quality regulations under Title 40 of the Code of Federal Regulations (CFR). Section 303 of the CWA requires states to adopt water quality standards for all surface waters of the United States. Section 304(a) requires EPA to publish advisory water quality criteria that accurately reflect the latest scientific knowledge on the kind and extent of all effects on health and welfare that may be expected from the presence of pollutants in water. Where multiple uses exist, water quality standards must protect the most sensitive use. As described in the discussion of state regulations below, the SWRCB and its nine RWQCBs have designated authority in California to identify beneficial uses and adopt applicable water quality objectives.

Federal Antidegradation Policy

The Federal Antidegradation Policy was enacted to provide protection to high-quality water resources of national importance. It directs states to develop and adopt statewide antidegradation policies that include protecting existing instream water uses and maintaining a level of water quality necessary to protect those existing uses and the water quality of high-quality waters. In EPA's CWA regulations regarding water quality standards (40 CFR Chapter 1, Section 131.12[a][3]), the criteria for requiring an antidegradation standard includes the following conditions:

- Existing instream water uses and a level of water quality necessary to maintain those uses shall be maintained and protected.
- Water quality will be maintained and protected in waters that exceed water quality levels necessary for supporting fish, wildlife, and recreational activities, and water quality, unless the state deems that water quality levels can be lowered to accommodate important economic or social development. In these cases, water quality levels can only be lowered to levels that support all existing uses.
- Where high quality waters constitute an outstanding National resource, such as waters of national and state parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.

STATE

State Water Resources Control Board

In California, SWRCB has broad authority over water quality control issues for the state. SWRCB is responsible for developing statewide water quality policy and exercises the powers delegated to the state by the federal government under the CWA. Regional authority for planning, permitting, and enforcement is delegated to the nine RWQCBs. The regional boards are required to formulate and adopt water quality control plans for all areas in the region and establish water quality objectives in the plans.

San Francisco Bay Basin Water Quality Control Plan

Under the Porter-Cologne Act, each RWQCB must formulate and adopt a water quality control plan (known as a "Basin Plan") for its region. The Plan Area is within the jurisdiction of the San Francisco Bay Regional Water Board. The Basin Plan for the San Francisco Bay Region includes a comprehensive list of waterbodies within the region and detailed language about the components of applicable Water Quality Objectives (WQOs). The Basin Plan recognizes natural water quality, existing and potential beneficial uses, and water quality problems associated with human activities throughout the region. Through the Basin Plan, the San Francisco RWQCB executes its regulatory authority to enforce the implementation of TMDLs, and to ensure compliance with surface WQOs. The Basin Plan includes both narrative, and numerical WQOs designed to provide protection for all designated and potential beneficial uses in all its principal streams and tributaries. Applicable beneficial uses include municipal and domestic water supply, irrigation, non-contact and contact water recreation, groundwater recharge, fresh water replenishment, hydroelectric power generation, and preservation and enhancement of wildlife, fish, and other aquatic resources.

San Francisco Bay TMDLs

The San Francisco Bay is affected by pollutants carried in inflows from the Sacramento and San Joaquin Rivers, and historic and ongoing pollution from urban and industrial activities. Overall, there are fourteen active TMDLs in the San Francisco Bay estuary system. The Bay Area Urban Creeks TMDL is applicable to the Plan Area waterways.

Bay Area Urban Creeks - Diazinon and Pesticide-Related Toxicity

This TMDL was established in 2007 and applies to all Bay Area urban creeks, including creeks not currently identified as impaired. In the early 1990s, high levels of pesticides (particularly diazinon) in Bay area creeks created toxicity issues for aquatic organisms, causing mortality and impacting reproduction. Pesticides, including diazinon, enter urban creeks through urban stormwater runoff and dry weather discharges from storm drains, with much smaller contributions from direct discharge (dumping or riparian weed control). Urban runoff contains pesticides applied by professionals and individuals to control pests on residential and commercial landscapes, around building foundations and roadways, and at commercial and industrial locations (EPA 2015). Factors that affect pesticide concentrations in urban creeks include the amount used, the chemical and physical properties or the pesticide, the sites where pesticides are used, and irrigation practices and precipitation. The objectives of the pesticide TMDL are to eliminate acute or chronic pesticide related toxicity in urban creek water or sediments, and to maintain diazinon concentrations below 100 nanograms per liter as a one-hour average. Since implementation of the TMDL, diazinon conditions have improved considerably (due primarily to cancellation of its approval for non-agricultural uses), however toxicity related to other pesticides and sediment toxicity in urban creek remain a concern. This TMDL is primarily enforced through the Municipal NPDES permit system.

Porter-Cologne Water Quality Control Act

California's primary statute governing water quality and water pollution issues with respect to both surface waters and groundwater is the Porter-Cologne Water Quality Control Act of 1970 (Porter-Cologne Act). The Porter-Cologne Act grants the SWRCB and each of the nine RWQCBs power to protect water quality and is the primary vehicle for implementation of California's responsibilities under the CWA. The applicable RWQCB for the WVFMP is the San Francisco RWQCB. SWRCB and the San Francisco RWQCB have the authority and responsibility to adopt plans and policies, regulate discharges to surface and groundwater, regulate waste disposal sites, and require cleanup of discharges of hazardous materials and other pollutants. The Porter-Cologne Act also establishes reporting requirements for unintended discharges of any hazardous substances, sewage, or oil or petroleum products.

State Nondegradation Policy

In 1968, as required under the federal antidegradation policy described previously, SWRCB adopted a nondegradation policy aimed at maintaining high quality for waters in California. The nondegradation policy states that the disposal of wastes into state waters shall be regulated to achieve the highest water quality consistent with maximum benefit to the people of the state and to promote the peace, health, safety, and welfare of the people of the state. The policy states:

a) Where the existing quality of water is better than required under existing water quality control plans, such quality would be maintained until it has been demonstrated that any change would be consistent with maximum benefit to the people of the state and would not unreasonably affect present and anticipated beneficial uses of such water.

b) Any activity which produces waste or increases the volume or concentration of waste and which discharges to existing high-quality waters would be required to meet waste discharge requirements.

LOCAL

As a constitutionally-created state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies. Therefore, relevant regulations are summarized below.

UC Berkeley 2020 LRDP

The UC Berkeley 2020 LRDP contains the following policies related to hydrology that are applicable to the WVFMP (UC Berkeley 2005):

- Policy: Manage the Hill Campus landscape to reduce fire and flood risk and restore native vegetation and hydrology patterns (page 57).

City of Berkeley General Plan

Berkeley General Plan policies pertaining to hydrology and water quality relevant to implementation of the WVFMP include the following (City of Berkeley 2001):

- Policy EM-23 Water Quality in Creeks and San Francisco Bay: Take action to improve water quality in creeks and San Francisco Bay.

- Action D) Restore a healthy freshwater supply to creeks and the Bay by eliminating conditions that pollute rainwater, and by reducing impervious surfaces and encouraging use of swales, cisterns, and other devices that increase infiltration of water and replenishment of underground water supplies that nourish creeks.
- Action F) Encourage the maintenance and restoration of creeks and wetlands and appropriate planting to cleanse soil, water, and air of toxins.

- **Policy EM-25 Groundwater:** Protect local groundwater by promoting enforcement of state water quality laws that ensure non-degradation and beneficial use of groundwater.

City of Oakland General Plan

The Open Space, Conservation and Recreation Element of the Oakland General Plan, adopted in 1996, addresses the management of open land, natural resources, and parks in Oakland. The following policies are relevant to implementation of the WVFMP (City of Oakland 1996):

Objective CO-5 Water Quality: To minimize the adverse effects of urbanization on Oakland's groundwater, creeks, lakes and nearshore waters.

- **Policy CO-5.2 Improvements to Groundwater Quality**: Support efforts to improve groundwater quality, including the use of non-toxic herbicides and fertilizers, the enforcement of anti-litter laws, the clean-up of sites contaminated by toxics, and ongoing monitoring by the Alameda County Flood Control and Water Conservation District.
- **Policy CO-5.3 Control of Urban Runoff:** Employ a broad range of strategies, compatible with the Alameda Countywide Clean Water Program, to: (a) reduce water pollution associated with stormwater runoff; (b) reduce water pollution associated with hazardous spills, runoff from hazardous material areas, improper disposal of household hazardous wastes, illicit dumping, and marina "live-aboards"; and (c) improve water quality in Lake Merritt to enhance the lake's aesthetic, recreational, and ecological functions.

Objective CO-6: To protect the ecology and promote the beneficial uses of Oakland's creeks, lakes, and nearshore waters.

- **Policy CO-6.1 Creek Management:** Protect Oakland's remaining natural creek segments by retaining creek vegetation, maintaining creek setbacks, and controlling bank erosion. Design future flood control projects to preserve the natural character of creeks and incorporate provisions for public access, including trails, where feasible. Strongly discourage projects that bury creeks or divert them into concrete channels.

3.9.3 Impact Analysis and Mitigation Measures

ANALYSIS METHODOLOGY

Evaluation of potential hydrologic and water quality impacts is based on a review of existing documents and studies that address water resources in the vicinity of the UC Berkeley Hill Campus, including technical reports and plans prepared for the UC Berkeley LRDP and the 2011 Berkeley Watershed Management Plan. Additionally, this analysis is based on information gained from DWR groundwater publications, FEMA flood mapping, water quality data published by the SWRCB and San Francisco RWQCB, and other referenced sources. Information obtained from these sources was reviewed and summarized to describe the existing conditions above and to identify potential environmental effects, based on the standards of significance presented in this section. In determining the level of significance, this analysis assumes that the project would comply with relevant federal, state, and local laws, ordinances, and regulations. Significance determinations account for the influence of relevant EPMs, which are incorporated into treatment design; the full text of EPMs is presented in Section 2.6 "Environmental Protection Measures."

SIGNIFICANCE CRITERIA

An impact on hydrology or water quality is considered significant if implementation of the WVFMP would:

- violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality;
- substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin;
- substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner that would
  - result in substantial erosion or siltation on- or off-site;
  - substantially increase the rate or amount of surface runoff in a manner which would result in flooding on-or off-site;
  - create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation; and/or
- conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

ISSUES NOT EVALUATED FURTHER

The following issues are not evaluated further in the EIR for the reasons summarized below. Refer to the Initial Study in Appendix C of this EIR for additional explanation.

The proposed Plan could require use of water for emergency use during prescribed burns or for dust abatement during minor grading activities. However, the amount of water required during treatments implemented under the Plan would be negligible and short-term. No new, permanent demand for water would be created. In addition, Plan implementation would not create any impervious surfaces which would interfere with groundwater recharge. Therefore, implementation of the Plan would not substantially decrease groundwater supplies, interfere substantially with groundwater recharge, or conflict with a sustainable groundwater management plan; these issues are not evaluated further.

Plan implementation would not substantially alter the existing drainage pattern within the Plan Area. Additionally, Plan implementation would not alter the course of any stream or waterway or add any impervious surfaces. Therefore, Plan implementation would not substantially increase the rate or amount of surface runoff in a manner which would result in flooding; this issue is not evaluated further.

Plan implementation could require the use of water for emergency use during prescribed burns or for dust abatement during minor grading activities. However, the amount of water needed during treatments implemented under the Plan would be negligible and short-term. Plan implementation would not generate permanent water drainage flows. Plan implementation would not substantially alter the existing drainage pattern within the Plan Area; it would not alter the course of any stream or waterway or add any impervious surfaces. Therefore, the Plan could not create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; this issue is not evaluated further.

The Plan Area is not located within a flood hazard area, tsunami or seiche zone, and the only flooding hazard is the potential for Strawberry Creek to overflow. Plan implementation would not place any structures in or adjacent to Strawberry Creek. Plan implementation would not substantially alter the existing drainage pattern within the Plan Area nor would it alter the course of any stream or waterway or add any impervious surfaces. Additionally, Implementation of the Plan would not result in construction of buildings or other facilities or storage materials on site where they could be inundated by tsunami, floodwater, or seiche. Therefore, the effects of flood flows and pollution of floodwaters are not evaluated further.

IMPACT ANALYSIS

Impact HYD-1: Substantially Degrade Surface or Ground Water Quality Through the Implementation of Prescribed Burning

The WVFMP would use broadcast burning and pile burning treatments to reduce fuel loads and to maintain treatment areas. Prescribed burning would occur when conditions favor low severity fires and increased erosion would be minimal. However, the steep terrain and high runoff conditions within the Plan Area create an environment where ash and sediment from burns can be carried long distances and potentially be deposited in watercourses. Burns near watercourses could increase erosion and water temperatures. For these reasons, prescribed burning implemented under the WVFMP could potentially degrade water quality; this impact would be **significant.**

None of the Identified Treatment Projects would include prescribed broadcast burning or pile burning; therefore, **no impact** would occur.

<u>General Effects of Fire on Water Quality</u>

Prescribed burning, like any landscape-scale disturbance, can result in adverse effects to water quality. However, the degree to which water quality is affected is dependent on several factors including the severity of the fire, the intensity of precipitation events following the fire, and the hydrologic connectivity of the burned area to downstream waterbodies.

Severe fires have resulted in catastrophic erosion rates and water quality effects, typically when intense burning by wildfires is followed by large rainfall events (Wallbrink et al. 2004; Dahm et al. 2015). High severity burns generally consume all surface litter, plants, and branches (large woody debris). Stumps, logs, and trees will be deeply charred and black, often with 100 percent tree mortality. Characteristically, an area burned at high severity has extensive exposed mineral soil, often greater than 80 percent (Lewis et al. 2006). High severity fires in California typically occur in the summer and fall near the end of the dry season.

To reduce the potential for high severity fire, prescribed burning is typically planned for seasons where fuel moisture levels are high enough to slow the spread and reduce the intensity of fire. Prescribed burns are designed to be low-severity fires in confined areas, which leave fine fuels such as litter and small woody debris partially charred and consumed, and little mineral soil exposed (Lewis et al. 2006; Cawson et al. 2012). Because of this, the risk of water quality effects is typically low for prescribed burning.

Fire affects the rate of runoff by removing the vegetation canopy that intercepts raindrops, reducing plant litter on the ground surface that slows overland flow, and creating water repellency in surface soils. The vegetation cover reduces runoff and erosion by intercepting rainfall, protecting the soil surface, and creating surface roughness which increases ponding and slows water movement. The amount of surface litter has a strong influence on infiltration and runoff rates and can account for nearly two-thirds of the variability in the amount of sediment carried in runoff (Cawson et al. 2012). A summary of multiple studies found that sediment yield increased exponentially when bare soil exceeded 60-70 percent (Cawson et al. 2012).

The vegetation canopy in riparian areas provides shade and cover for adjacent water bodies in addition to providing many other ecosystem services. During low intensity fires or backing fires, riparian areas can act as fire breaks due to their high fuel moisture content. However, the capacity of riparian vegetation to affect fire behavior depends on the environmental conditions driving the fire and the size, moisture content, and topography of the riparian area (Kobziar and McBride 2006). When fire intensity is high enough to destroy riparian vegetation, stream temperature, flow, and nutrient inputs may be increased (Kobizar and McBride 2006).

In addition to sediment, the runoff from burned areas often carries increased levels of nutrients, metals, and certain organic pollutants. Combustion of plants and natural materials releases metals, nitrogen compounds, phosphorus, calcium, magnesium, and potassium and toxic organic and inorganic compounds (Crouch et al. 2006; Wallbrink et al. 2004). These materials can be carried in runoff and in high enough concentrations can adversely affect water quality leading to changes in pH, decreased dissolved oxygen levels, and even toxicity. Fires may also burn vegetation adjacent to watercourses leading to greater inputs of solar radiation and increased water temperature. These changes would be greatest in small, shallow watercourses, such as those within the Plan Area.

The degree to which a burned area is hydrologically connected to a water body has a strong influence on the potential for water quality effects. For instance, sediment eroded from an upper area of a catchment may be distributed and held in depressions or trapped by vegetation in unburned areas rather than being discharged into a water body. Conversely, roads, tracks, and skidpaths can become extensions of the drainage system and enhance the efficiency of runoff routing and sediment transport to streams (Wallbrink et al. 2004). In a low intensity burn, variations in fire severity and the presence of unburned areas create a mosaic of patches. Higher severity burns are often found on ridges and drier aspects, with lower severity or unburnt areas found in gullies and on wetter aspects (Cawson at al. 2012). This patchiness influences hydrologic connectivity with bare patches acting as sediment sources and vegetated areas as sediment sinks. Vegetated patches are most effective when they are located near to the catchment outlet or as buffers surrounding a waterbody (Cawson et al. 2012).

<u>Overall WVFMP (Program-level Analysis)</u>

The WVFMP would use broadcast burning and pile burning treatments. Broadcast burning implemented under the WVFMP would be conducted when fuel moisture and environmental conditions allow for effective understory and ladder fuel control while reducing the risk of high severity fire. In addition, EPM AQ-1 would require that all prescribed burns would include the development of a burn plan which includes fire behavior modeling. The risk of water quality degradation would be reduced through careful planning to avoid high severity burns and maintain burns within their prescription. However, the Plan Area is located in steep terrain and is dominated by soils with high runoff potential (refer to Table 3.6-1 in Section 3.6, Geology and Soils). This means that after any burn, ashes and compounds released from the burning of plant materials could be carried long distances before infiltrating in the soil. As discussed above, runoff from burned areas can carry sediment and pollutants into waterbodies. If a prescribed broadcast burn resulted in the loss of shading vegetation immediately adjacent to a watercourse, water temperatures could be increased substantially through solar radiation. Without the preservation of unburned vegetation along watercourses to slow runoff and trap nutrients and sediment, and maintain water temperatures, prescribed broadcast burning treatments and treatment maintenance activities would have the potential to adversely affect water quality.

Pile burning conducted under the WVFMP would create patches of high severity burning. The soils within the footprints of burn piles would likely experience water repellency caused by the vaporization of organic materials such as plant litter and duff by high heat. As organic vapors cool and condense, soils are coated by naturally occurring water repellent hydrocarbons (Lewis et al. 2006; Wallbrink et al. 2004). Water repellency typically occurs within the upper two inches of the soil profile and persists for several weeks (Hubbert et al. 2006). For piles burned in the fall, this would increase the risk that ashes and sediments at pile sites would be carried downhill during winter and spring rains. In the general landscape, these patches of water repellent soil would be surrounded by unburned vegetation which would capture and infiltrate runoff and pollutants from pile footprints. Additionally, EPM HYD-1 prohibits pile burning within 25 feet of a watercourse and limits the size of burn piles to minimize the spatial extent of soil damage. However, for burn piles located on steep slopes above watercourses, the buffer area of unburned vegetation may not be wide enough to capture runoff from pile footprints.

<u>Summary</u>

Prescribed broadcast burning implemented under the WVFMP for initial treatments and treatment maintenance would occur when conditions favor low severity fire. Pile burning would likely create water repellent soils; however, they would be surrounded by unburned vegetation which would capture and infiltrate runoff and pollutants from pile footprints. The topography and runoff conditions in the Plan Area create an environment where ash and sediment can be carried long distance and potentially deposited in watercourses. Additionally, burns near watercourses could increase streamside erosion and water temperatures. For these reasons, prescribed burning implemented under the WVFMP could potentially degrade water quality; this impact would be **significant**.

<u>Identified Treatment Projects (Project-level Analysis)</u>

None of the Identified Treatment Projects would involve the use of prescribed broadcast burning or pile burning. Therefore, **no impact** would occur.

Mitigation Measures

Mitigation Measure HYD-1: Establish Watercourse Protection Buffers

UC Berkeley will establish watercourse protection buffers (WPBs) as defined below on either side of watercourses within the Plan Area. The buffer system described below is similar to the Watercourse and Lake Protection Zone classification defined in 14 CCR Section 916.5, but has been tailored to local conditions in the Plan Area and specifics of the WVFMP. WPBs will be classified based on the uses of the stream and the presence of aquatic life. Wider WPBs are required for steep slopes. The table below provides a summary of procedures for determining WPB widths.

Procedures for Determining Watercourse Protection Buffer (WPB) Widths

Water Class	Class I	Class II	Class III
Water Class Characteristics or Key Indicator Beneficial Use	1) Domestic supplies, including springs, on site and/or within 100 feet downstream of the treatment site and/or 2) Fish always or seasonally present onsite, includes habitat to sustain fish migration and spawning.	1) Fish always or seasonally present offsite within 1000 feet downstream and/or 2) Aquatic habitat for nonfish aquatic species. 3) Excludes Class III waters that are tributary to Class I waters.	No aquatic life present, watercourse showing evidence of being capable of sediment transport to Class I and II waters under normal high-water flow conditions.
WPB Width (feet) – Distance from top of bank to the edge of the protection zone			
< 30 Percent Slope	75	50	25
30-50 Percent Slope	100	75	50
> 50 Percent Slope	150	100	75

Source: adapted from 14 CCR Section 916.5 [936.5, 956.5]

- The following WPB protections will be applied for all treatments:
  - To protect water temperature, filter strip properties, upslope stability, and fish and wildlife values, the following vegetation retention guidelines will be implemented within WBPs:
    - Class 1 and 2 watercourses: At least 50 percent of the overstory and 50 percent of the understory canopy covering the ground and adjacent waters will be left in a well distributed multi-storied stand composed of a diversity of species similar to that found before the start of operations.
    - Class 3 watercourses: At least 50 percent of the total canopy covering the ground will be left in a well distributed multi-storied stand configuration composed of a diversity of species similar to that found before the start of operations. At least 75 percent surface cover and undisturbed area will be retained.
  - Equipment, including tractors and vehicles, will not be driven in wet areas or WPBs, except over existing roads or watercourse crossings where vehicle tires or tracks remain dry.
  - Equipment used in vegetation removal operations will not be serviced in WPBs or other wet areas, or in locations that would allow grease, oil, or fuel to pass into lakes, watercourses, or wet areas.
  - WPBs will be kept free of slash, debris, and other material, including burn piles, that could degrade water quality. Accidental deposits will be removed immediately.
  - No fire ignition will occur within WPBs; however low intensity backing fires may be allowed to enter or spread into WPBs.
  - Large areas of bare soil within WPBs that are exposed by treatment activities will be stabilized with mulching, grass seeding, or soil stabilizers before the beginning of the rainy season (October 15).

Significance after Mitigation

Overall WVFMP

Implementation of Mitigation Measure HYD-1 would preserve unburned vegetative buffers around watercourses within the Plan Area. This mitigation measure would facilitate the capture and filtration of stormwater runoff from burned areas before reaching watercourses, thereby avoiding or reducing potential degradation of water quality. With implementation of Mitigation Measure HYD-1, the potential water quality impacts from prescribed burning under the WVFMP would be **less than significant**.

Impact HYD-2: Substantially Degrade Surface or Ground Water Quality Through the Implementation of Manual or Mechanical Treatment Activities

The WVFMP includes manual and mechanical treatment activities for initial treatments as well as maintenance. All manual and mechanical treatments implemented under the WVFMP would integrate EPMs into treatment design to protect watercourses, limit equipment use on wet soils or steep slopes, stabilize highly disturbed areas, prevent concentration of runoff in non-shaded fuel breaks, and prevent spill or leaks from equipment. Implementation of EPMs would avoid and minimize the risk of substantial degradation to surface or groundwater quality from manual or mechanical treatment activities. This impact would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects.

Overall WVFMP (Program-level Analysis)

Manual treatment and maintenance activities are unlikely to cause levels of ground disturbance that would result in erosion that could affect water quality. Additionally, EPM HYD-1 prohibits leaving cut materials within 20 feet of a watercourse or swale. However, manual treatments near watercourses could remove vegetation that provides stream shading and temperature control for the small streams within the Plan Area; this would result in increases in water temperature that could degrade water quality.

The mechanical treatment and maintenance activities implemented under the WVFMP would use heavy equipment that could loosen and disturb soils, remove ground surface litter in some areas exposing the soil surface and facilitating erosion, and compact soils so that they are not able to infiltrate or filter runoff. Additionally, reestablishment and use of existing unpaved roads and landings could require vegetation removal or grading which could accelerate erosion. Rain of sufficient intensity and duration could dislodge soil particles, generate runoff, and cause localized erosion. Water quality protections are avoidance of sensitive areas (such as waterbodies or areas prone to erosion) and providing undisturbed buffers between work areas and watercourses. EPM HYD-1 prohibits heavy equipment operation within 50 feet of watercourses. Additionally, EPM BIO-5 requires that project areas are clearly delineated to avoid sensitive biological areas which would include wetlands, wet meadows, or riparian areas. These protections would maintain a vegetated buffer between mechanical treatment areas and watercourses which would act as a filter to slow runoff from adjacent treatment areas, allow infiltration of stormwater, and trap sediment that could otherwise be carried into surface waters. EPM GEO-1 prohibits ground disturbance during precipitation or heavy equipment operation over saturated soils, when such activity could produce ruts where runoff could concentrate. Off-road heavy equipment operation would be prohibited on slopes steeper than 30 percent (EPM GEO-3) to reduce the potential for erosion. Additionally, highly disturbed areas would be stabilized with mulch before the start of the rainy season (EPM GEO-2). As described in Section 2.5.2, “Treatment Maintenance and Monitoring,” UC Berkeley would monitor treatment areas for canopy cover, erosion, and soil stability annually for the first five years and then again in years 7 and 9 following initial treatment.

Mechanical treatments would be the primary treatment activity used to create non-shaded fuel breaks, which would involve extensive ground disturbance and removal of most vegetation within the treatment area. The loss of vegetative canopy would result in an increase in stormwater runoff from these treatment areas, potentially carrying high sediment loads. Non-shaded fuel breaks would typically be placed on ridgelines where there is little contributing watershed area, and therefore lower runoff volumes. However, in some cases natural topography could direct stormwater to flow down the length of the fuel break where it could become concentrated and contribute to erosion. EPM GEO-4 incorporates California Forest Practice Rules (14 CCR Section 914.6), which prescribe the use of waterbreaks to divert runoff from fuel breaks and roads into adjacent areas where it can infiltrate naturally. Waterbreaks would be spaced every 50 to 300 feet depending on the slope and erosion hazard rating of the underlying soil. Where waterbreaks cannot effectively disperse surface runoff, other erosion controls would be implemented as needed. Waterbreaks are required to be installed upslope of watercourses regardless of the maximum distances specified in California Forest Practice Rules (14 CCR Section 914.6), which would help prevent concentrated runoff from being directed into a stream or drainage.

The equipment used for mechanical treatment and maintenance require the use of fuels and lubricants. The potential for spills and leaks of fuels and lubricants to affect water quality would be minimized through application of EPM HYD-1, which requires that equipment be fueled and serviced outside of WPBs and wet areas, and EPM HAZ-1, which requires that all equipment be maintained and regularly inspected for leaks. Additionally, EPM HAZ-2 requires that UC Berkeley prepare a Spill Prevention and Response Plan and maintain a spill kit onsite. Implementation of these EPMs would prevent and effectively remediate spills of fuels and lubricants onto soils that could be carried by runoff into adjacent waterbodies.

Summary

Under the WVFMP, UC Berkeley would implement EPMs that protect watercourses, limit equipment use on wet soils or steep slopes, stabilize highly disturbed areas, prevent concentration of runoff in non-shaded fuel breaks, and prevent spill or leaks from equipment. Therefore, the risk of substantial degradation to surface or groundwater quality from manual and mechanical treatments and maintenance activities implemented through the WVFMP would be **less than significant**.

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and would require the same types of equipment and vehicles as described above for the overall WVFMP. The same EPMs described for the overall WVFMP would also apply during implementation of the Identified Treatment Projects.

The Hearst Gate Fuel Break, which would include only manual vegetation removal, is located approximately 345 feet from the nearest watercourse. TRAs 2-4 are also located 200 feet or more from the nearest watercourse. Because of their distance from watercourses, these projects have limited potential to affect water quality within the Plan Area.

The East-West Fuel Break project would be located on Claremont Ridge. The nearest watercourses to this project site are ephemeral tributaries to Claremont and Hamilton Creeks, located 80 to 100 feet downslope of the project boundary. Once implemented, the East-West Fuel Break could direct stormwater to flow down the length of the fuel break where it could become concentrated and contribute to erosion and sedimentation. In addition, the project area for TRA 1 and for the three proposed Strawberry, Claremont, and Frowning FHR projects intersect perennial watercourses or their ephemeral tributaries. Ground disturbance adjacent to these watercourses could cause increased erosion and sedimentation, resulting in degradation of water quality. Furthermore, the equipment used for mechanical vegetation treatment requires fuel and lubricants that could degrade water quality if spilled or leaked into watercourses. These projects would be required to implement EPMs that protect watercourses, limit equipment use on wet soils or steep slopes, stabilize highly disturbed areas, prevent concentration of runoff in non-shaded fuel breaks, and prevent spill or leaks from equipment, as described for the overall WVFMP above. Therefore, substantial degradation to surface or groundwater quality from manual and mechanical treatments implemented under the Identified Treatment Projects would not occur; this impact would be **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

Impact HYD-3: Substantially Degrade Surface or Ground Water Quality Through Managed Herbivory

Implementation of the WVFMP includes the use of managed herbivory to reduce fuels and would incorporate livestock best management practices which would exclude grazing animals from sensitive areas, limit the duration of grazing, provide alternative water sources, prohibit grazing in saturated soils, and require the relocation of animals when erosion is observed. For these reasons, the risk of substantial degradation to surface or groundwater quality from managed herbivory would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects**.**

None of the Identified Treatment Projects would include managed herbivory; therefore, **no impact** would occur.

Overall WVFMP (Program-level Analysis)

The WVFMP includes the use of managed herbivory to treat vegetation. When allowed to move according to their own preferences, grazing animals will often congregate near water sources and in riparian areas where vegetation is lusher and more abundant. Grazing animals near water resources can result in even greater impacts to hydrologic resources and water quality compared to areas removed from water resources. The action of animal hoofs can lead to erosion of stream banks, alteration of drainage patterns, or soil compaction on slopes that drain to hydrologic resources, which can increase the speed and volume of runoff. Accumulation of manure and urine can also contribute nutrients and pathogens to adjacent waterbodies (Higgins et al. 2011). The potential for water quality effects from managed herbivory can be effectively controlled through active grazing management and application of best practices (Freitas et al. 2014, Higgins et al. 2011). Relevant best practices are encompassed in EPMs GEO-1, GEO-3, and HYD-1.

Implementation of EPM GEO-1 would prohibit managed herbivory from occurring in saturated soils or within one week following an inch or more of rain, unless the ground could support the weight of livestock without creating ruts. Implementation of EPM GEO-3 would require the relocation of grazing animals upon observation of accelerated soil erosion. These EPMs would avoid impacts to hydrologic resources and water quality caused by grazing animals after rain events, as well as impacts caused by the persistence of grazing animals in erosion-prone areas. Both EPMs would reduce livestock's impact on erosion, sedimentation, and alteration of drainage patterns.

Implementation of EPM HYD-1 would avoid potential impacts to hydrologic resources and water quality by establishing a buffer around water resources where livestock would be excluded. Active herding or fencing would be used to prevent livestock from grazing within 50 feet from environmentally sensitive areas, including waterbodies, wetlands, or riparian areas. Alternate water sources would be provided to the livestock in areas that are not environmentally sensitive.

Managed herbivory could occur throughout the year and would encompass up to 100 acres of the Plan Area annually. As stated in Section 2.5.2 "Description of Vegetation Treatment Activities," active goat and sheep grazing would occur up to 8 hours per day, and the herd would be secured in a holding pen at night. Livestock would typically only graze a given area for one day. Grazed areas would be examined daily to make sure the grasses are eaten low but high enough to prevent erosion and to prevent trail blazing by goats (e.g., crating ruts in the soil). These restrictions on managed herbivory would avoid impacts to water quality caused by the persistence of grazing animals in one area for extended periods of time, which could result in the stripping of vegetation, loss of soil structure, and accumulation of manure and urine.

Summary

Because managed herbivory implemented under the WVFMP would exclude grazing animals from sensitive areas, limit the duration of grazing, provide alternative water sources, prohibit grazing in saturated soils, and require the relocation of animals when erosion is observed, the risk of substantial degradation to surface or groundwater quality from managed herbivory would be avoided and minimized. This impact would be **less than significant**.

Identified Treatment Projects (Project-level Analysis)

None of the Identified Treatment Projects would include managed herbivory; therefore, **no impact** would occur.

Mitigation Measures

No mitigation is required for this impact.

Impact HYD-4: Substantially Degrade Surface or Ground Water Quality Through the Application of Herbicides

Herbicides would be applied in a targeted manner, by hand, and according to the manufacturer's label directions and consistent with EPMs which limit herbicide use in sensitive areas or under conditions that could lead to misapplication and require each project to be prepared to respond to a spill. Because projects implemented under the WVFMP would integrate these protective measures into treatment design, including for the Identified Treatment Projects, risk of substantial degradation to surface or groundwater quality from herbicide application would be avoided and minimized. This impact would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects.

General Effects of Herbicides on Water Quality

In general, the use of herbicides can affect water quality through off-site movement of herbicides from runoff, leaching, drift, and misapplication or spills. Surface water can be affected by any of these means but only leaching has the potential to degrade groundwater. Site conditions, chemical characteristics, and application technique are other factors that can influence how likely an herbicide is to enter runoff and degrade water quality. Herbicides applied to wet soil, areas of shallow groundwater, or applied when significant precipitation is expected are more likely to be problematic, particularly when applied using aerial or boom spraying techniques.

Once an herbicide is applied, it is absorbed into plant tissues, which prevents the herbicide from becoming a water contaminant. However, not all herbicides are fully absorbed by a plant. When this occurs, the herbicide begins to break down intro simpler compounds, which are usually less toxic (CUCE 2016). The rate at which an herbicide degrades after applied can affect how likely it is for an herbicide to persist in the environment and move off-site through runoff. For all soil types, the rate of degradation is affected by pH, temperature, moisture content, sunlight and concentration of the active ingredient. Higher temperatures, greater soil moisture, high bacterial activity, and high levels of organic matter tend to accelerate degradation; dry and cold conditions tend to lengthen degradation (refer to Appendix G of this EIR for additional information). Herbicide molecules can also physically bind to soil particles, known as adsorption. The strength of the bonds depends on the interaction of the pesticide's chemical properties, its concentration in the soil water, the soil pH and the composition of the soil (percent sand, silt, loam, clay, and organic matter). If bound to the soil, the herbicide is unlikely to leach or runoff, unless the soil itself is moved by erosion (CUCE 2016).

In addition to transport in runoff, herbicides can reach water through drift, which is the airborne movement of herbicides beyond a treatment area. The risk of drift is affected by the application technique and weather conditions. Aerial or boom applications are most likely to reach water through drift because the herbicide must settle through the air to reach the treatment area. Spot and localized treatments are less likely to drift because hand application techniques are used in close proximity to target vegetation, and less overall herbicide is applied.

The first line of protection for water quality is the herbicide product label. Not all herbicides act the same way in the environment: some are active for only a short time while others may persist for years and they also have varying degrees of water solubility and soil absorption. Additionally, each herbicide may have several formulations for specific uses. Because of this complexity, herbicide manufacturers must assess the properties of their products, such as solubility, adsorption, and persistence, and include appropriate precautions on the label. Each herbicide product carries a legally enforceable label which provides critical information about product use. Before an herbicide can be registered for sale, EPA requires extensive scientific data on the potential health and environmental effects. EPA evaluates the data and ensures that the label describes a set of conditions, directions, and precautions that define how and where the product can be safely used. Following the directives of the product label greatly reduces the potential for herbicides to be applied in a way that contaminates water resources.

Overall WVFMP (Program-level Analysis)

The WVFMP includes the ground application of herbicides by hand to prevent the growth or regrowth of target species. Herbicides would be used for initial treatment as well as for treatment maintenance activities. Herbicides would be applied directly to the surface of a stump, resprout, or foliar sprayed over target vegetation until every leaf is wetted, but not dripping. Because these techniques allow applicators to precisely place herbicides on target plants, only small quantities of the herbicide are needed, and the potential for herbicides to enter soils or become airborne and ultimately enter surface or groundwater is limited. In addition, percolation of stormwater runoff into groundwater does not occur easily in most sections of the Plan Area because of the area's steep slopes and abundance of Maymen soils. Therefore, due to the limited and targeted application of herbicides under the WVFMP and limited groundwater recharge that occurs in the Plan Area, groundwater would not be substantially degraded from herbicide use under the Plan and it is not discussed further.

Although unlikely, there is a potential for herbicides to affect surface waters by entering stormwater runoff if not fully absorbed or degraded prior to a large precipitation event or from herbicide drift during foliar spray applications. EPM HYD-2 would be implemented by UC Berkeley and its contractors, which prohibits herbicide application during precipitation or if precipitation is forecast 24 hours before or after treatment activities. Some formulations may require longer precipitation-free windows, as required by the label, which would be adhered to by applicators (EPM HAZ-3). Additionally, EPM HYD-2 prohibits non-aquatic herbicide formulations from being applied, stored, or mixed within 60 feet of aquatic habitats, riparian areas, or other areas where there is the possibility the herbicide could contact water. These precautions would greatly reduce the potential for herbicides to enter stormwater runoff and contaminate surface waters. Furthermore, EPM HAZ-5 prohibits spray applications of herbicides when wind speeds are 7 miles per hour or greater and requires the use of low pressure spray nozzles kept within 24 inches of the target vegetation, consistent with University of California Cooperative Extension recommendations to reduce the risk of herbicide drift (UCCE 2020). These protections, along with compliance with label requirements, would avoid and minimize the potential for herbicide drift and associated impacts to surface waters.

Although the protections described above would prevent impacts to water quality during and following herbicide application, the accidental misapplication or spill of an herbicide in close proximity to surface waters could also degrade water quality. The potential for water quality degradation from an accidental misapplication or spill would depend on the location and site conditions, herbicide formulation, and size of the spill. In addition to the label requirements and state and federal regulations for storage, transport, mixing and container disposal, EPM HAZ-1 requires that all equipment used for herbicide applications be inspected and maintained every day, and if anything is found leaking, it would be promptly removed from a treatment site. In addition, EPM HAZ-2 requires that all projects implemented under the WVFMP develop a Spill Prevention and Response Plan and that projects maintain an onsite spill kit throughout the life of the activity. EPM HAZ-4 also includes requirements for rinsing and disposal of herbicide containers and requires that equipment and personnel washing occur in a manner that protects water resources. These protections would minimize the potential for accidental misapplication or spills of herbicides to occur, and if one was to occur, a prompt response is required, which would minimize the potential to affect water quality.

Summary

As discussed above, groundwater degradation would not occur under the WVFMP due to the limited and targeted application of herbicides under the WVFMP and limited groundwater recharge that occurs in the Plan Area. Treatment and treatment maintenance activities implemented under the WVFMP would apply herbicides only by hand, in accordance with the manufacturer's label directions, and implement all relevant EPMs including adherence to federal and state regulations, which would reduce the potential for contamination of surface waters. Although the use of herbicides carries inherent risks, the precautions described above would minimize the risk of substantial degradation of surface water quality from herbicide application; this impact would be **less than significant**.

Identified Treatment Projects (Project-level Analysis)

All of the proposed Identified Treatment Projects include application of herbicides for invasive plant control and vegetation management. The same EPMs described for the overall WVFMP would also apply during implementation of the Identified Treatment Projects, as further described below.

The East-West and Hearst Gate fuel breaks would use only cut-stump application of herbicides. As discussed under Impact HYD-2, no watercourses are located within the treatment boundaries of these projects. The nearest watercourses are ephemeral tributaries to Claremont and Hamilton Creeks, located 80 to 100 feet downslope of the East-West Fuel Break project boundary. Due to the type of herbicide application proposed and the distance to watercourses, the potential for these projects to adversely affect water quality is very low.

TRAs 2, 3, and 4 are located 200 feet or more from the nearest watercourses; TRA 1 is intersected by an ephemeral stream and is 15 feet from a perennial stream (Claremont Creek). Foliar spray application of herbicides is proposed to prevent regrowth of vegetation following manual and mechanical treatments. Herbicides applied in any of the TRAs have the potential drift to non-target areas including surface waters, and herbicides applied in TRA 1 have the potential to affect the intersecting ephemeral stream if applied when its flowing, or the nearby perennial stream, from stormwater runoff or an accidental spill. As discussed above for the overall WVFMP, EPM HYD-2 would prohibit herbicide application during precipitation, if precipitation is forecast 24 hours before or after treatment activities, or for longer precipitation free windows as required by the label (EPM HAZ-3), which would reduce the potential for herbicides to enter stormwater runoff. EPM HYD-2 also prohibits non-aquatic herbicide formulations from being applied, stored, or mixed within 60 feet of aquatic habitats, riparian areas, or other areas where there is the possibility the herbicide could contact water. EPM HAZ-1 requires that all equipment used for herbicide applications be inspected and maintained every day, and if anything is found leaking, it would be promptly removed from a treatment site. In addition, EPM HAZ-2 requires that all projects implemented under the WVFMP develop a Spill Prevention and Response Plan, which would include precautions to prevent spills and a response plan should one occur. Furthermore, EPM HAZ-5 would prohibit spray applications of herbicides when wind speeds are 7 miles per hour or greater and requires the use of low-pressure spray nozzles kept within 24 inches of the target vegetation to reduce the risk of herbicide drift. These protections, along with compliance with label requirements, would avoid and minimize the potential for herbicides to enter surface waters and substantially degrade water quality when used in TRAs 1 – 4.

The Strawberry, Claremont, and Frowning FHR projects would include cut-stump and/or basal bark herbicide application methods following manual and mechanical treatments. Perennial watercourses and their tributaries are present within each of the FHR project areas. These herbicide application methods are not subject to drift concerns because very small quantities of the herbicides are used; and in the case of cut-stump application, the herbicide is applied directly to the fresh cut-stump, and in the case of basal bark application, very targeted and low pressure spraying of the lower 12 – 15 inches of a resprout is conducted in very close proximity (i.e., within inches of the resprout). Because the FHR project areas contain watercourses, there is potential that herbicides could enter surface waters through stormwater runoff or the accidental misapplication or spill and degrade water quality. However, the same EPMs as described above for the overall WVFMP and TRAs 1 – 4 would be implemented for the FHR projects (EPM HYD-2, EPM HAZ-1 through EPM HAZ-5). These protections, along with compliance with label requirements, would avoid and minimize the potential for herbicides to enter surface waters and substantially degrade water quality when used in the FHR projects.

<u>Summary</u>

As discussed above, groundwater degradation would not occur as a result of the Identified Treatment Projects due to the limited and targeted application of herbicides that would occur and limited groundwater recharge that occurs in the Plan Area. Although surface waters exist within and in close proximity to some of the Identified Treatment Project sites, UC Berkeley would only apply herbicides by hand and in accordance with the manufacturer's label directions, state and federal laws, and implement all relevant EPMs. Although the use of herbicides carries inherent risks, the precautions described above would minimize the risk of substantial degradation of surface water quality from herbicide application; this impact would be **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

Impact HYD-5: Violate Water Quality Standards, Waste Discharge Requirements, or Conflict with the Water Quality Control Plan From WVFMP Implementation

All of the treatment activities under the WVFMP have the potential to degrade water quality through erosion and sedimentation (e.g., from mechanical equipment use or managed herbivory) or from the use of hazardous materials (e.g., fuels/oils and herbicides), which would conflict with implementation of the Basin Plan. The WVFMP would avoid significant adverse effects to water quality from manual and mechanical equipment use, managed herbivory, and herbicide application through the incorporation of EPMs and adherence to regulatory requirements protecting water quality. The WVFMP would also use broadcast burning and pile burning treatments to reduce fuel loads and to maintain treatment areas. The steep terrain and high runoff conditions within the Plan Area create an environment where ash and sediment from burns can be carried long distances and potentially be deposited in watercourses. For this reason, prescribed burning implemented under the WVFMP could potentially degrade water quality such that conflict with the Basin Plan would occur; this impact would be **significant.**

The Identified Treatment Projects would be implemented using manual and mechanical treatment activities and herbicide use, and no prescribed burning would occur. Significant adverse effects to water quality from manual and mechanical equipment use and herbicide application would be avoided through the implementation of EPMs and adherence to regulatory requirements protecting water quality. Because no prescribed burning would occur, implementation of the Identified Treatment Projects would not substantially degrade water quality such that conflict with implementation of the Basin Plan. This impact would be **less than significant** for the Identified Treatment Projects.

Overall WVFMP (Program-level Analysis)

As discussed in Section 3.9.2, "Regulatory Setting," above, the San Francisco RWQCB has prepared a water quality control plan (i.e., the Basin Plan) for the San Francisco Bay region. Through the Basin Plan, the San Francisco RWQCB executes its regulatory authority to enforce the implementation of TMDLs for impaired waterbodies and to ensure compliance with WQOs. Within the Plan Area, the only waterbody that has been designated as impaired is Strawberry Creek. However, a TMDL was established in 2007 for Bay Area urban creeks even if they are not currently identified as impaired, which applies to all creeks within the Plan Area.

As described in Impact HYD-1 through Impact HYD-4, all of the treatment activities proposed under the WVFMP have the potential to degrade water quality, either through erosion and sedimentation (e.g., from prescribed burns or managed herbivory), or from the use of hazardous materials (e.g., fuels/oils and herbicides). Substantial degradation of the quality of any surface waters from implementation of the WVFMP would conflict with implementation of the Basin Plan and violate associated water quality standards. However, the WVFMP would avoid significant adverse effects to water quality and hydrology through the incorporation of EPMs, which would protect water quality by: minimizing erosion and prohibiting the use of heavy equipment on steep slopes (EPMs BIO-6, GEO-1, GEO-2, and GEO-3); using only aquatic herbicide formulations in wet areas and prohibiting the use of non-aquatic herbicides near waterbodies (EPM HYD-2); excluding managed herbivory and pile burning near watercourses (EPM HYD-1); implementing protocols to prevent leaks, spills, and misapplication of herbicides and other chemicals (EPM HAZ-1 through HAZ-5); and requiring careful planning of prescribed fire to avoid severe burns. Together, these EPMs would avoid any substantial degradation of water quality and associated conflicts with implementation of the Basin Plan for all treatment activities except prescribed burning. As described in Impact HYD-1, the risk of water quality degradation from prescribed burning would be reduced through careful planning to avoid high severity burns and maintain burns within their prescription. However, the Plan Area is located in steep terrain and is dominated by soils with high runoff potential. This means that after any burn, ashes and compounds released from the burning of vegetation could be carried long distances and potentially enter waterbodies. Additionally, burns that occur near watercourses could increase streamside erosion and water temperatures. For these reasons, prescribed burning implemented under the WVFMP could potentially degrade water quality such that conflict with implementation of the Basin Plan would occur; this impact would be **significant**.

Identified Treatment Projects (Project-level Analysis)

The Identified Treatment Projects would involve the same manual and/or mechanical vegetation treatment activities and herbicide use that would occur under the WVFMP; however, no prescribed burning or managed herbivory would occur. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects, which would prevent substantial water quality degradation and associated conflicts with the Basin Plan from manual and mechanical treatment activities and herbicide application. With the implementation of EPMs, and because no prescribed burning would be used to implement the Identified Treatment Projects, this impact would be **less than significant.**

Mitigation Measures

Mitigation Measure HYD-1: Establish Watercourse Protection Buffers

Significance after Mitigation

Overall WVFMP

Implementation of Mitigation Measure HYD-1 would preserve unburned vegetative buffers around watercourses within the Plan Area. This mitigation measure would facilitate the capture and filtration of stormwater runoff from burned areas before reaching watercourse, thereby avoiding or reducing potential degradation of water quality. With implementation of Mitigation Measure HYD-1 conflict with implementation of the Basin Plan from prescribed burning under the WVFMP would not occur; this impact would be **less than significant**.

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3.10 NOISE AND VIBRATION

This section includes a description of ambient-noise conditions, a summary of applicable regulations related to noise and vibration, and an analysis of potential short-term noise impacts associated with implementation of the proposed Plan. Mitigation measures are recommended as necessary to reduce significant noise impacts. Additional data is provided in Appendix H, "Noise Modeling Calculations."

There were no comments received on the Notice of Preparation related to noise or vibration.

3.10.1 Environmental Setting

ACOUSTIC FUNDAMENTALS

The following sections provide information on the technical terms referenced throughout this section.

Sound, Noise, and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a human ear. Noise is defined as loud, unexpected, annoying, or unwanted sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

Frequency

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source, also called the sound pressure level (SPL). SPL is most commonly described by using decibels (dB) because this logarithmic unit best corresponds to the way the human ear interprets sound pressures.

Addition of Decibels

Because decibels are logarithmic units, SPLs expressed in dB cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3 dB increase. In other words, when two identical sources are each producing sound of the same loudness at the same time, the resulting sound level at a given distance would be 3 dB higher than if only one of the sound sources was producing sound under the same conditions. For example, if one idling truck generates an SPL of 70 dB, two trucks idling simultaneously would not produce 140 dB; rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together produce a sound level approximately 5 dB louder than one source.

A-Weighted Decibels

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz and perceive sounds within this range better than sounds of the same amplitude with frequencies outside of this range. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies. Then, an "A-weighted" sound level (expressed in units of A-weighted decibels) can be computed based on this information.

The A-weighting approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgment correlates well with the A-scale sound levels of those sounds. Thus, noise levels are typically reported in terms of A-weighted decibels. All sound levels discussed in this section are expressed in A-weighted decibels. Table 3.10-1 describes typical A-weighted noise levels for various noise sources.

Table 3.10-1 Typical A-Weighted Noise Levels

Common Outdoor Activities	Noise Level (dB)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1,000 feet	— 100 —	
Gas lawn mower at 3 feet	— 90 —	
Diesel truck at 50 feet at 50 miles per hour	— 80 —	Food blender at 3 feet, garbage disposal at 3 feet
Noisy urban area in daytime, gas lawn mower at 100 feet	— 70 —	Vacuum cleaner at 10 feet, normal speech at 3 feet
Commercial area, heavy traffic at 300 feet	— 60 —	
Quiet urban area in daytime	— 50 —	Large business office, dishwasher next room
Quiet urban area in nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban area in nighttime	— 30 —	Library, bedroom at night
Quiet rural area in nighttime	— 20 —	
	— 10 —	Broadcast/recording studio
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Notes: dB = decibels

Source: Caltrans 2013a: Table 2-5.

Human Response to Changes in Noise Levels

As described above, the doubling of sound energy results in a 3-dB increase in the sound level. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different from what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear can discern 1-dB changes in sound levels when exposed to steady, single-frequency ("pure-tone") signals in the mid-frequency (1,000–8,000 Hz) range. In general, the healthy human ear is most sensitive to sounds between 1,000 and 5,000 Hz and perceives both higher and lower frequency sounds of the same magnitude with less intensity (Caltrans 2013a:2-18). In typical noisy environments, changes in noise of 1–2 dB are generally not perceptible. However, it is widely accepted that people can begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 5-dB increase is generally perceived as a distinctly noticeable increase, and a 10-dB increase is generally perceived as a doubling of loudness (Caltrans 2013a:2-10). Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dB increase in sound would generally be perceived as barely detectable.

Ground Vibration

Vibration is the periodic oscillation of a medium or object with respect to a given reference point. Ground-borne vibration is vibration of and through the ground. Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains, and traffic on rough roads.

Ground vibration levels generated by construction activity can be transient, random, or continuous. Transient construction vibrations are generated by blasting, impact pile driving, and wrecking balls. Continuous vibrations are generated by vibratory pile drivers, large pumps, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment.

Common Noise Descriptors

Noise in our daily environment fluctuates over time. Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors used throughout this section.

Equivalent Continuous Sound Level (L_{eq}): L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound level that occurs during the same period (Caltrans 2013a:2-48). For instance, the 1-hour equivalent sound level, also referred to as the hourly L_{eq}, is the energy average of sound levels occurring during a 1-hour period and is the basis for noise abatement criteria used by California Department of Transportation (Caltrans) and Federal Transit Administration (FTA) (Caltrans 2013a:2-47; FTA 2018:210).

Maximum Sound Level (L_{max}): L_{max} is the highest instantaneous sound level measured during a specified period (Caltrans 2013a:2-48; FTA 2018:207–208).

Day-Night Level (L_{dn}): L_{dn} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-dB "penalty" applied to sound levels occurring during nighttime hours between 10 p.m. and 7 a.m. (Caltrans 2013a:2-48; FTA 2018:214).

Community Noise Equivalent Level (CNEL): CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m. and a 5-dB penalty applied to the sound levels occurring during evening hours between 7 p.m. and 10 p.m. (Caltrans 2013a:2-48). Many agencies and local jurisdictions in California often have established noise standards using the CNEL metric. The CNEL metric is not used by federal agencies and not commonly used in standards established by local communities outside of California.

Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The manner in which a noise level decreases with distance depends on the factors described below.

Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance from a point source. Noise from a line source (e.g., road) propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source.

Ground Absorption

The propagation path of noise from a source to a receiver is usually very close to the ground. Noise attenuation from ground absorption and reflective wave–canceling provides additional attenuation associated with geometric spreading. Traditionally, this additional attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 feet. The Plan Area is an acoustically absorptive or soft site (i.e., has an absorptive ground surface between the source and the receiver, such as soft dirt, grass, or scattered bushes and trees). Therefore, the Plan Area has an additional ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the attenuation rate associated with cylindrical spreading, the additional ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance. This would hold true for point sources, resulting in an overall drop-off rate of up to 7.5 dB per doubling of distance.

Atmospheric Effects

Receivers located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels, as wind can carry sound. Other factors such as air temperature, humidity, and turbulence can also affect sound attenuation.

Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction (Caltrans 2013a:2-41; FTA 2018:42). Barriers higher than the line of sight provide increased noise reduction (FTA 2018:16). Vegetation between the source and receiver is rarely effective in reducing noise because it does not create a solid barrier unless there are multiple rows of vegetation of sufficient height (FTA 2018:15, 104, 106).

EXISTING NOISE ENVIRONMENT

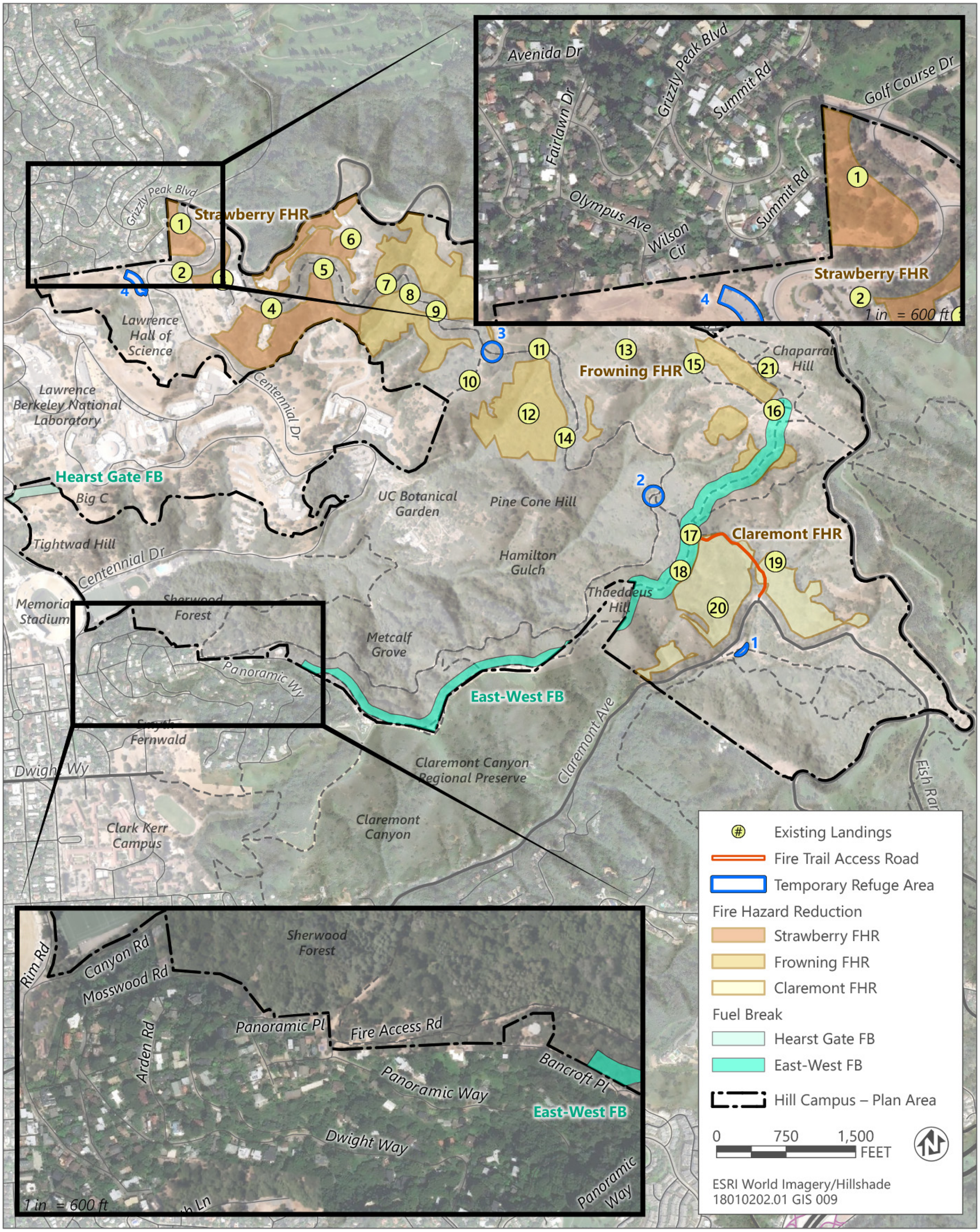
Existing Noise-Sensitive Land Uses

Noise-sensitive land uses are generally considered those where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels, and because of the potential for nighttime noise to result in sleep disruption. Additional land uses such as transient lodging, historic sites, cemeteries, and places of worship are also generally considered sensitive to increases in noise levels. Noise-sensitive recreational land uses located in the Plan Area include the University of California Botanical Garden, Strawberry Canyon Recreation Area, and the fire trails within the UC Berkeley Hill Campus; refer to Section 3.11, “Recreation,” for additional information on these land uses.

The nearest noise-sensitive receptors are the residences located directly northwest and southwest of the Plan Area boundary. Most of these residences are located within the jurisdictional boundary of the City of Berkeley, and some residences along the southwest boundary of the Plan Area are located within the City of Oakland. Identified Treatment Projects located close to off-site residences include Strawberry FHR, Temporary Refuge Area 4, and East-West FB. However, Temporary Refuge Area 4 is located within a paved parking lot and no noise generating treatment activities would be conducted at this Identified Treatment Project. Some residences along Summit Road and Grizzly Peak Boulevard are located adjacent to the westernmost border of Strawberry FHR, and some residences in the Panoramic Hill neighborhood along Panoramic Way and Panoramic Place are located adjacent to the westernmost end of the East-West FB. Refer to Figure 3.10-1 for a map with the location of these roadways relative to the Plan Area boundary and the Identified Treatment Projects. This figure shows the locations of the Identified Treatment Projects and the locations of all noise-sensitive receptors discussed in the analysis.

Existing Noise Sources and Ambient Levels

The existing noise environment within the Plan Area consists primarily of vehicular traffic on the roadway network. Within the Hill Campus, sounds generated by people are common along the fire trails. Away from roadways and trails, noise sources include natural sounds such as birds, wind, and tree movement. The noise measurements taken for the UC Berkeley 2020 Long Range Development Plan EIR provide noise levels that characterize the existing noise environment of the Plan Area and the surrounding land uses. A short-term noise measurement taken in 2003 at the end of Canyon Road describes the existing noise environment of the Hill Campus as having an approximate ambient noise level of 58 L_{eq} and a maximum noise level of 68 dB L_{max} (UC Berkeley 2004:4.9-11). Because no additional substantial noise sources have been developed or identified in the or near the Plan Area since that time it is assumed that this sound level measurement is generally representative of existing conditions.



Source: data downloaded from University of California, Berkeley in 2019

Figure 3.10-1 Noise Sensitive Receptors

3.10.2 Regulatory Setting

The regulations identified below are applicable at the program and project level.

FEDERAL

U.S. Environmental Protection Agency Office of Noise Abatement and Control

The U.S. Environmental Protection Agency (EPA) Office of Noise Abatement and Control was originally established to coordinate Federal noise control activities. In 1981, EPA administrators determined that subjective issues such as noise would be better addressed at more local levels of government. Consequently, in 1982 responsibilities for regulating noise control policies were transferred to state and local governments. In the case of the WVFMP, the cities of Berkeley and Oakland are the local jurisdictions that determine noise standards and regulations. These policies are discussed below. Documents and research completed by the EPA Office of Noise Abatement and Control also provides value in the analysis of noise effects.

STATE

California Building Code Sound Transmission Standards

Noise within habitable units that is attributable to external sources is regulated by the California Building Standards codified in CCR, Title 24, Part 2, Section 1207. These standards are enforceable at the time of construction or during occupancy and apply to habitable units with common interior walls, partitions, and ceilings or those adjacent to public areas such as halls, corridors, stairways, and service areas. Under these standards the interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room. The noise metrics used to measure these levels can be day-night average sound level (L_{dn}) or Community Noise Equivalent Level (CNEL), consistent with the local general plan. An acoustical analysis documenting compliance with the interior sound level standards shall be prepared for structures containing habitable rooms. Under California Public Resources Code Section 25402.1(g), all cities and counties in the state are required to enforce the adopted California Building Code, including these standards for noise in interior environments.

This regulation applies to residential land uses that are located close to the Plan Area and would help minimize interior noise levels from outdoor noise-generating activities.

LOCAL

As a constitutionally related state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies and applying local standards as thresholds of significance. Presented separately below are applicable policies and regulatory standards of local jurisdictions adjacent to the Plan Area that have noise-sensitive receptors located near the Plan Area.

City of Berkeley

City of Berkeley General Plan

The City of Berkeley General Plan Environmental Management Element briefly discusses the city's policies on noise. The plan does not include any noise standards. Noise standards are addressed in the City of Berkeley Municipal Code.

City of Berkeley Municipal Code

The City of Berkeley Municipal Code Chapter 13.40, "Community Noise," contains the following noise policies and standards that may be applicable to the types of activities that would be implemented under the Plan:

- Section 13.40.050 establishes exterior noise standards, shown in Table 13.40-1 of the Municipal Code. (The standards for different residential land use zonings are presented as Table 3.10-2 in this EIR.)

Table 3.10-2 Exterior Noise Standards for Residential Land Uses

Zoning District	Time Period	Allowable Exterior Noise Level (dB)
Single-family, restricted two-family, limited two-family, restricted multiple family, and environmental safety residential	7 a.m. to 10 p.m. 10 p.m. to 7 a.m.	55 45
Multi-family and high-density residential	7 a.m. to 10 p.m. 10 p.m. to 7 a.m.	60 55

Notes: dB = decibels

The standards listed above shall not exceed: the standard for a cumulative period of 30 minutes in any hour; or the standard plus 5 dB for a cumulative period of more than 15 minutes in an hour; or the standard plus 10 dB for a cumulative period of more than 5 minutes in an hour; or the standard plus 15 dB for a cumulative period of more than 1 minute in an hour; or the standard plus 20 dB for any period of time.

If the measured ambient noise level exceeds the standard, the sound level shall not exceed: the ambient noise level for a cumulative period of 30 minutes in any hour; or the ambient noise level plus 5 dB for a cumulative period of more than 15 minutes in an hour; or the ambient noise level plus 10 dB for a cumulative period of more than 5 minutes in an hour; or the ambient noise level plus 15 dB for a cumulative period of more than 1 minute in an hour; the ambient noise level plus 20 dB for any period of time.

Source: City of Berkeley 2009:42.

- Section 13.40.060 establishes interior noise standards, shown in Table 13.40-2 [presented as Table 3.10-3 in this EIR].

Table 3.10-3 Interior Noise Standards for All Residential Land Uses

Land Use	Time Interval	Allowable Interior Noise Level (dB)
All residential	7 a.m. to 10 p.m. 10 p.m. to 7 a.m.	45 40

Notes: dB = decibels; L_{eq} = Equivalent Continuous Sound Level

Noise levels apply to residential dwellings with windows in their normal seasonal configuration.

No person shall operate or cause to be operated within a multi-family dwelling unit any source of sound or allow the creation of any noise which causes the sound level when measured inside a neighboring dwelling unit to exceed: the interior noise standard for a cumulative period of more than 5 minutes in any hour; or the interior noise standard plus 5 dB for a cumulative period of more than 1 minute in any hour; or the interior noise standard plus 10 dB for any period of time.

If the measured ambient noise level exceeds the standard, the interior noise level shall not exceed: the ambient noise level for a cumulative period of more than 5 minutes in any hour; or the ambient noise level plus 5 dB for a cumulative period of more than 1 minute in any hour; or the ambient noise level plus 10 dBA for any period of time.

Source: City of Berkeley 2009:43.

- Section 13.40.070 lists the following prohibited acts related to noise and vibration that may be applicable to the types of activities that would be implemented under the Plan:
  - Keeping or maintaining, or permitting to be kept or maintained, upon any premises owned, occupied, or controlled by any person of any animal or animals, which by any frequent or long continued noise shall cause annoyance or discomfort to two or more reasonable persons of normal sensitiveness who reside in separate residences (including apartments and condominiums). However, a [noncommissioned officer] or his or her agent may proceed on the basis of a complaint of only one person, if circumstances are determined to exist whereby a noise disturbance caused by an animal affects only one individual. Any noise which is audible continuously for 10 minutes or intermittently for 30 minutes shall be *prima facie* evidence of such annoyance or discomfort. Factors which can be used to evaluate excessive animal noise include but are not limited to (a) pitch, (b) pattern, and (c) frequency of occurrence. This subsection may be enforced by an Animal Control Officer.
  - Operating or permitting the operation of any mechanically powered saw, sander, drill, grinder, lawn or garden tool, or similar tool before 7:00 a.m. on a weekday (or before 9:00 a.m. on a weekend or holiday) or after 7:00 p.m. on a weekday (or after 8:00 p.m. on a weekend or holiday) such that the sound therefrom across a residential or commercial real property line violates Section 13.40.050 or 13.40.060.

- Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration, or demolition work before 7:00 a.m. on a weekday (or before 9:00 a.m. on a weekend or holiday) or after 7:00 p.m. on a weekday (or after 8:00 p.m. on a weekend or holiday) such that the sound therefrom across a residential or commercial real property line violates Section 13.40.050 or 13.40.060, except for emergency work of public service utilities or by variance issued by the [Environmental Health Division]. (This section shall not apply to the use of domestic power tools as specified in subsection B.11 of this section.)
- Where technically and economically feasible, construction activities shall be conducted in such a manner that the maximum sound levels at affected properties will not exceed those listed in the following schedules [presented as Table 3.10-4 and 3.10-5 in this EIR]:

Table 3.10-4 Maximum Sound Levels for Nonscheduled, Intermittent, Short-Term Operation of Mobile Equipment at Residential Land Uses

	Maximum Allowable Noise Level at Single-Family and Limited Two-Family Residential Land Uses (dB)	Maximum Allowable Noise Level at Multi-Family Residential Land Uses (dB)
Weekdays 7 a.m. to 7 p.m.	75	80
Weekends and legal holidays 9 a.m. to 8 p.m.	60	65

Notes: dB = decibels

Short-term is defined as lasting less than 10 days.

Source: City of Berkeley 2009:44.

Table 3.10-5 Maximum Sound Levels for Repetitively Scheduled and Relatively Long-Term Operation of Stationary Equipment at Residential Land Uses

	Maximum Allowable Noise Level at R-1 and R-2 Residential Land Uses (dB)	Maximum Allowable Noise Level at R-3 and above Multi-Family Residential Land Uses (dB)
Weekdays 7 a.m. to 7 p.m.	60	65
Weekends and legal holidays 9 a.m. to 8 p.m.	50	55

Notes: dB = decibels

Long-term is defined as lasting a period of 10 days or more.

Source: City of Berkeley 2009:44.

- Section 13.40.070 provides the following exemptions that may be applicable to the types of activities that would take place under the Plan:
  - The emission of sound for the purpose of alerting persons to the existence of an emergency; or the emission of sound in the performance of emergency work.
  - Warning devices necessary for the protection of public safety, as for example, police, fire and ambulance sirens, and train horns, shall be exempted from the provisions of this chapter.

For purposes of the analysis in this EIR, it is assumed that the noise standards listed in Tables 3.10-4 and 3.10-5 are L_{eq} standards and not L_{max} standards, because standards of 60 and 65 dB L_{max} would be substantially more stringent than the exterior noise standard of 60 dB CNEL recommended in OPR General Plan Guidelines for residential land uses (OPR 2017:378).

City of Oakland

City of Oakland General Plan

The City of Oakland General Plan Noise Element contains the following noise policies and standards that may be applicable to the types of activities that would be implemented under the Plan:

- Land use compatibility noise standards are listed in Figure 6 of the General Plan Noise Element, which include:
  - Normally acceptable noise standard of 60 dB L_{dn} or CNEL for residential land uses.
  - Normally acceptable noise standard of 65 dB L_{dn} or CNEL for neighborhood parks.

City of Oakland Municipal Code

The City of Oakland Municipal Code briefly discusses the city's policies on noise. Section 8.18.010, Subsection C5 of the code identifies noise-generating acts that are prohibited, including the intentional sounding or permitted sounding outdoors of any fire, burglar, or civil defense alarm, siren, whistle, or similar stationary emergency signaling device not in compliance with subsection (C)(5)(a) or (b), unless occurring for emergency purposes. It is assumed that this exemption includes sirens used for public emergency vehicles such as fire trucks.

City of Oakland Planning Code

The City of Oakland Planning Code Chapter 17.120.050 establishes the following noise policies and standards that may be applicable to the types of activities that would take place under the Plan:

- The maximum allowable noise levels in residential land uses during daytime hours (7 a.m. to 10 p.m.) may not exceed 60 dB for a 20 minute period, 65 dB for a 10 minute period, 70 dB for a 5 minute period, 75 dB for a 1 minute period, or 80 dB anytime.
- The maximum allowable noise levels in residential land uses during nighttime hours (10 p.m. to 7 a.m.) may not exceed 45 dB for a 20 minute period, 50 dB for a 10 minute period, 55 dB for a 5 minute period, 60 dB for a 1 minute period, or 65 dB anytime.
- If the measured ambient noise level exceeds any of the standards listed above, the ambient noise level becomes the allowable noise level.
- Each of the noise level standards specified above shall be reduced by five (5) dBA for a simple tone noise such as a whine, screech, or hum, noise consisting primarily of speech or music, or for recurring impulse noise such as hammering or riveting.
- Construction-generated noise must follow the standards in Table 17.120.04 [presented as Table 3.10-6 in this EIR].

Table 3.10-6 Maximum Allowable Noise Levels at Residential Land Uses for Construction-Generated Noise

Type of Construction	Maximum Allowable Noise Level for Weekdays from 7 a.m. to 7 p.m. (dB)	Maximum Allowable Noise Level for Weekends from 9 a.m. to 8 p.m. (dB)
Short-Term Operation	80	65
Long-Term Operation	65	55

Notes: dB = decibels

Short-term construction is defined as lasting less than 10 days.

Long-term construction is defined as lasting a period of 10 days or more.

The nighttime noise level received by any land use and produced by any construction or demolition activity between weekday hours of seven (7) p.m. and seven (7) a.m. or between eight (8) p.m. and nine (9) a.m. on weekends and federal holidays shall not exceed the applicable nighttime noise level standards outlined in this Section.

Source: City of Oakland Planning Code Table 17.120.04

For purposes of the analysis in this EIR, it is assumed that the noise standards listed in Table 3.10-6 are L_{eq} standards and not L_{max} standards, because the standard of 65 dB L_{max} would be substantially more stringent than the exterior noise standard of 60 dB CNEL recommended in OPR General Plan Guidelines for residential land uses (OPR 2017:378).

3.10.3 Impact Analysis and Mitigation Measures

ANALYSIS METHODOLOGY

To assess potential noise impacts associated with implementation of the proposed Plan, sensitive receptors and their relative exposure were identified. Noise levels generated by treatment activities were determined based on methodologies, reference emission levels, and usage factors from FTA's *Guide on Transit Noise and Vibration Impact Assessment* methodology (FTA 2018) and FHWA's *Roadway Construction Noise Model User's Guide* (FHWA 2006). Reference noise levels for most equipment is well documented and the usage thereof is common practice in the field of acoustics. Where no reliable published reference noise level is available for a particular type of equipment that would be used in treatment activities, such as specialized tree-handling equipment, a representative noise level from another type of equipment similar in design, size, and function was used as a proxy piece of equipment. This approach is similar to the way noise generated by construction and demolition activity is commonly evaluated for development projects because vegetation treatment activities also involve the temporary use of noise-generating equipment for relatively short periods of time near existing development.

In addition, this analysis accounts for the influence of relevant Environmental Protection Measures (EPMs), which would be incorporated into treatment activities. The full text of EPMs is presented in Section 2.6 "Environmental Protection Measures."

SIGNIFICANCE CRITERIA

The significance criteria are based on Appendix G of the State CEQA Guidelines and the noise standards established by local jurisdictions.

An impact related to noise is considered significant if implementation of the WVFMP would:

- generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies; an increase is considered substantial if it would:
  - expose residential land uses in the City of Berkeley to noise levels that exceed the City of Berkeley's Maximum Sound Levels for Nonscheduled, Intermittent, Short-Term Operation of Mobile Equipment at Residential Land Uses (as shown in Table 3.10-4) or Maximum Sound Levels for Repetitively Scheduled and Relatively Long-Term Operation of Stationary Equipment at Residential Land Uses (as shown in Table 3.10-5);
  - expose residential land uses in the City of Oakland to noise levels that exceed the City of Oakland's Maximum Allowable Noise Levels at Residential Land Uses for Construction-Generated Noise (as shown in Table 3.10-6);
- generate excessive groundborne vibration or groundborne noise levels; or
- for project areas located within the vicinity of a private airstrip or an airport land use plan, or where such a plan has not been adopted, within two miles of a public airport of public use airport, expose people residing or working in the project area to excessive noise.

ISSUES NOT EVALUATED FURTHER

The following issues are not evaluated further in the EIR for the reasons summarized below. Refer to the Initial Study in Appendix C of this EIR for additional explanation.

Implementation of the Plan would not result in the long-term operation of any stationary noise sources or result in a permanent increase in vehicle trips that would contribute to traffic noise levels on local roadways. Therefore, the Plan would not result in a permanent increase in ambient noise levels within the Project Area or the surrounding land uses, and permanent increases in ambient noise are not evaluated further.

Treatment activities implemented under the Plan would not include activities that can result in excessive ground vibration, such as pile driving, drilling, boring, or blasting. Trucks and heavy equipment driving to and from treatment areas would generate relatively low levels of groundborne vibration, particularly because trucks would be traveling at reduced speeds through the Plan Area, which would minimize vibration. Vibration would typically be perceptible within 15 feet of the truck; however, buildings are generally set back from roadways by at least 15 feet, typically farther. Therefore, Plan implementation would not result in the exposure of sensitive receptors to levels of excessive vibration or groundborne noise levels that would cause annoyance to humans or structural damage to buildings; this issue is not evaluated further.

The nearest airport, Oakland International Airport, is located approximately 10 miles southeast of the Plan Area. Therefore, the Plan would not result in the exposure of people, on-site or off-site, to excessive noise levels associated with airport activity; this issue is not evaluated further.

IMPACT ANALYSIS

Impact NOI-1: Temporarily Expose Residences to a Substantial Increase in Noise Generated by Treatment Activities

Approximately 1.2 miles of the 8.9-mile boundary around the Plan Area is adjacent to residential land uses. Manual, mechanical, and prescribed broadcast burning treatment activities occurring near residential land uses could temporarily expose these receptors to noise levels that exceed City of Berkeley or City of Oakland standards, respectively. Some of the Identified Treatment Projects (i.e., Strawberry FHR and East-West FB) are near residences; manual and mechanical treatment activities required for implementation of these treatments could expose residential receptors to noise levels that exceed local standards. In addition, pile burning and chipping or mastication of biomass would use the same types of equipment as broadcast burning and mechanical treatment activities, respectively, and thus would also result in temporary noise levels exceeding local standards. EPMs would help minimize noise levels but would not avoid exceedance of local standards. This impact would be **significant** for the overall WVFMP as well as the Identified Treatment Projects.

Overall WVFMP

The Plan proposes five treatment activities, which include managed herbivory, herbicide application, manual treatments, mechanical treatments, and prescribed broadcast burning. These treatment activities would be used in various combinations to implement the four vegetation treatment types: evacuation support treatments, temporary refuge areas, fuel breaks (FB), and fire hazard reduction treatments (FHR). The treatment activities used would vary within the 800-acre Plan Area based on the treatment type, vegetation type, site topography, accessibility, ecological conditions, and other factors. In addition, biomass created by implementation of the WVFMP would be processed at the Richmond Field Station, located roughly 7 miles from the Plan Area, by incineration in an air curtain or processed onsite through chipping, mastication, or pile burning, and a small amount of logs would be strategically placed and left onsite.

Table 3.10-7 shows the noise level at 50 feet from the source for each noise-generating activity. Activities associated with managed herbivory and herbicide application would not involve the use of heavy-duty equipment and would not generate excessive noise levels and, therefore, are not included in Table 3.10-7. However, noise sources and levels associated with all treatment activities are discussed separately below.

Table 3.10-7 Noise Levels from Treatment Activities

Treatment Activity	Typical Equipment	Noise Level at 50 feet (dB L_{eq})
Manual Vegetation Treatment	Chainsaw	91
Mechanical Vegetation Treatment and Chipping/Mastication	Masticators, Tractors, Feller Bunchers	81
Prescribed Broadcast Burning and Pile Burning	Water tender	80

Notes: dB = decibels; L_{eq} = Equivalent Continuous Sound Level

Manual and mechanical vegetation treatment activity noise levels are the calculated combined noise level assuming that three pieces of equipment are operated in close proximity to each other.

The noise level shown for prescribed burning is for a single water tender, since only one would be used during a prescribed burn.

Source: FHWA 2006

Managed Herbivory

Managed herbivory consists of targeted grazing by domestic livestock to control vegetation. Up to 50 goats would be transported to the Plan Area from the Field Station for the Study of Behavior, Ecology, and Reproduction up to four times a year using trailers that transport up to 25 goats each. Targeted grazing by livestock requires staff and infrastructure including a herder, shepherd dog, solar electrified fencing, mineral blocks, and supplemental food and/or water. Activities associated with managed herbivory would not involve the use of heavy-duty equipment and would not generate excessive noise levels that exceed local standards. Additionally, managed herbivory is a part of the existing condition of the Plan Area because UC Berkeley has been using goats to manage grasslands and shrublands in the Plan Area since the 1980s.

Herbicide Application

Herbicide application implemented in the Plan Area would involve ground-level application of herbicides using backpack sprayers. Activities associated with herbicide application would not involve aerial applications or the use of heavy-duty ground equipment, and, thus, would not generate excessive noise levels that exceed local standards. Additionally, herbicide application is a part of the existing condition of the Plan Area because herbicides have been historically used on campus to control undesired plant species.

Manual Vegetation Treatment

Manual vegetation treatment involves the use of non-mechanized hand tools and hand-operated power tools to cut, clear, or prune vegetation. Activities would include thinning trees and shrubs; removing undesired species; manually pulling or digging out root systems of undesired plants; and placing mulch, such as wood chips, around certain areas to limit plant growth and minimize erosion. Work would occur on weekdays only from 8 a.m. to 6 p.m. Because non-mechanized hand tools such as shovels, McLeod fire tools, pruning shears, and hand saws would generate minimal noise, this analysis will focus on hand-operated power tools that would be used during implementation of manual vegetation treatments such as chainsaws and weed whips.

Chain saws, which are assumed to generate similar noise levels as concrete saws, generate reference noise levels of 90 dB L_{max} and 86 dB L_{eq} at 50 feet (FHWA 2006). Because multiple hand-operated power tools could be used concurrently during treatment implementation, this analysis conservatively assumes that three chainsaws would operate simultaneously in close proximity to each other, generating a combined noise level of 91 dB L_{eq} at 50 feet as shown in Table 3.10-7. This combined noise level would attenuate to the City of Berkeley's noise standard of 75 dB L_{eq} for single-family residences (as shown in Table 3.10-4) at a distance of 215 feet. Also, this combined noise level would attenuate to the City of Oakland's noise level standard of 80 dB L_{eq} for residential land uses (as shown in Table 3.10-6) at a distance of 135 feet. These distance estimates are conservative because they do not account for any additional attenuation that would be provided by existing buildings, structures, topography, or vegetation. See Appendix H for detailed noise calculations. Thus, when manual vegetation treatments would take place within 215 feet of residential land uses in the City of Berkeley or within 135 feet of residential land uses in the City of Oakland, the respective local noise standards could be exceeded.

Mechanical Vegetation Treatment

Mechanical vegetation treatment involves the use of heavy motorized equipment designed to cut, remove, or process vegetation. Mechanical treatment activities would include mowing, masticating/mulching, grubbing, and chipping, among others. The types of equipment used for such activities would include feller bunchers, yarders, skidders, masticators, tractors, brush cutters/mowers, cranes, wood chippers, and grapple saws. Several landing areas and skid roads already exist within the Plan Area, and no new landings or access roads would be created, although minor grading and clearing would occur at existing landings. Work would occur on weekdays only from 8:00 a.m. to 6:00 p.m.

Because of the spatial operational constraints of heavy equipment, it is unlikely that noise from multiple pieces of heavy-duty equipment would combine to affect the same noise-sensitive receptor at the same time. Therefore, this analysis assumes that multiple pieces of heavy equipment would not be located close enough to each other to create a combined noise level at nearby sensitive receptors. Masticators, which are assumed to generate similar noise levels as dozers, generate noise levels of approximately 85 dB L_{max} and 81 dB L_{eq} at 50 feet as shown in Table 3.10-7 (FHWA 2006). This noise level would attenuate to the City of Berkeley's noise standard of 75 dB L_{eq} for single-family residences (as shown in Table 3.10-4) at a distance of 87 feet. Also, this combined noise level would attenuate to the City of Oakland's noise level standard of 80 dB L_{eq} for residential land uses (as shown in Table 3.10-6) at a distance of 55 feet. These distance estimates are conservative because they do not account for any additional attenuation that would be provided by existing buildings, structures, topography, or vegetation. See Appendix H for detailed noise calculations. Thus, when mechanical vegetation treatments would take place within 87 feet of residential land uses in the City of Berkeley or within 55 feet of residential land uses in the City of Oakland, the respective local noise standards could be exceeded.

Prescribed Broadcast Burning

Prescribed broadcast burning would involve the use of low-intensity surface fires to control vegetation density and growth. Prescribed broadcast burning would be implemented using existing roads and trails as fire containment lines. Occasionally, fire containment lines would be constructed using manual or mechanical vegetation treatments, discussed above. To prepare an area for a prescribed broadcast burn or other treatment activities and their associated equipment would occasionally be used to trim, thin, or remove vegetation in advance of burning.

Prescribed broadcast burns would typically last one day and equipment would include 1–2 fire engines, an onsite water tender for fire suppression, and ignition devices such as drip torches. Ignition devices do not generate substantial noise levels. Fire engines would be located on-site for the duration of the prescribed broadcast burning activity but would only be used, with their sirens activated, in the event of an emergency. Sirens would generate substantial noise levels, but such emergency-related activity is exempt from noise standards by section 13.40.070 of the Berkeley Municipal Code and Section 8.18.010 Subsection C5 of the Oakland Municipal Code. Water tenders are specialized wildland fire response vehicles used for safety purposes during prescribed broadcast burns that generate noise levels similar to large trucks, which generate a reference noise levels of 84 dB L_{max} and 80 dB L_{eq} at 50 feet. This L_{eq} noise level would attenuate to the City of Berkeley's noise standard of 75 dB L_{eq} for single-family residences (as shown in Table 3.10-4) at a distance of 80 feet. Also, this noise level would attenuate to the City of Oakland's noise level standard of 80 dB L_{eq} for residential land uses (as shown in Table 3.10-6) at a distance of 50 feet. These distance estimates are conservative because they do not account for any additional attenuation that would be provided by existing buildings, structures, typography, or vegetation. See Appendix H for detailed noise calculations. When use of a water tender would occur within 80 feet of residential land uses in the City of Berkeley or within 50 feet of residential land uses in the City of Oakland, the respective local noise standards could be exceeded.

Biomass Disposal and Utilization

Biomass disposal and utilization would primarily involve hauling biomass to the Richmond Field Station to be incinerated in an air curtain, while some would be pile burned or chipped/masticated onsite and incorporated into treated areas, or left onsite as logs. The Richmond Field Station is a self-contained 170-acre research property located in a primarily low-density industrial area roughly 7 miles from the Plan Area. The incineration (i.e., burning) of vegetation in an air curtain would not generate excessive noise or exceed local noise standards. Chipping and mastication of biomass would use similar equipment as mechanical treatment activities and pile burning, like broadcast burning, would have a water tender onsite during the burn. Therefore, the same potential noise impacts from mechanical equipment use and water tenders as described above would occur during chipping/incineration and pile burning.

Treatment Maintenance and Monitoring

Follow-up maintenance and monitoring of treated areas would be implemented to retain the benefits of initial vegetation treatments. Post-treatment monitoring would be conducted immediately following vegetation treatments and on an annual basis to inform ongoing maintenance strategies. Maintenance treatments could be different than the original treatment used in the area but would not include any new treatment activities not discussed above.

Summary

Manual, mechanical, and prescribed burning treatment activities as well as chipping/mastication and pile burning occurring within certain distances from residential land uses could temporarily expose these receptors to noise levels that exceed local standards. Residences in the City of Berkeley that could be exposed to noise levels louder than the City of Berkeley noise standard of 75 dB L_{eq} are located along Campus Drive, Olympus Avenue, Wilson Circle, Summit Road, Grizzly Peak Boulevard, Canyon Road, Mosswood Road, Arden Road, Panoramic Way, and Panoramic Place. Residences in the City of Oakland that could be exposed to noise levels louder than the City of Berkeley noise standard of 80 dB L_{eq} are located in Panoramic Hill along Panoramic Way and Panoramic Place. Not all of the residences located along the streets identified above would be exposed to noise levels that exceed a local noise standard. Only residences that are located close to the boundary of the Plan Area along the streets mentioned above would be exposed to elevated noise levels due to treatment activities, and only when such activities occurred close to the boundary of the Plan Area.

Approximately 1.2 miles of the 8.9-mile boundary around the Plan Area is adjacent to residential land uses. Therefore, most of the treatment activities and associated biomass disposal under the Plan would occur in areas far away from residential receptors. Additionally, Plan implementation would not require the use of mechanical treatment over long periods of time in a single area. While certain residences located along the Plan Area boundary would occasionally be exposed to elevated noise levels, such exposure would be temporary and only occur when the noise generating activity is nearby. UC Berkeley facilities and academic buildings located within or close to the Plan Area would also occasionally be exposed to elevated noise levels similar to those experienced by the residential receptors that border the Plan Area. Noise levels generated by manual, mechanical, and prescribed burning treatment activities as well as chipping/mastication and pile burning would also fluctuate depending on the distance of the noise generating equipment to an individual receptor and the equipment used on a given day. The EPMs presented in Section 2.6, "Environmental Protection Measures" would help minimize these temporary noise impacts. The EPMs would require UC Berkeley and its contractors to limit operation of heavy equipment to daytime hours if noise generated would be audible to sensitive receptors and pause work during the university's Reading/Review/Recitation Week and finals week (EPM NOI-1); properly maintain all mechanical equipment and hand-operated power tools as well as utilize noise-reducing mufflers and engine shrouds (EPM NOI-2); keep engine shrouds closed during equipment operation (EPM NOI-3); and limit idling of motorized equipment to 5 minutes (EPM NOI-4). Additionally, any increase in noise levels at nearby residential receptors would be infrequent and temporary, as discussed above. Nevertheless, because local noise standards could be exceeded even with implementation of the EPMs, this impact would be **significant.**

Identified Treatment Projects

Nine Identified Treatment Projects are proposed as part of the WVFMP. Most of these treatment areas would not be located close to any residences or other noise-sensitive receptors. Equipment staging would occur within three existing landings in the vicinity of the East-West FB and would not be located close to any noise-sensitive receptors. None of the Identified Treatment Projects would utilize prescribed burning or managed herbivory treatments, or pile burning as a method to dispose of biomass. The Identified Treatment Projects located close to residential land uses that have the potential to generate noise levels that exceed applicable local noise standards at nearby residential receptors are Strawberry FHR and East-West FB. Each of these Identified Treatment Projects are discussed separately below.

Strawberry FHR

Strawberry FHR would be located close to a residential community in the City of Berkeley along the northwest boundary of the Plan Area, including homes along Summit Road and Grizzly Peak Boulevard. Strawberry FHR would undergo herbicide use and mechanical treatment activities across a 24-acre area, and chipping/mastication would likely occur to dispose of a portion of the biomass. As discussed above, herbicide application would not generate excessive noise levels but mechanical equipment would generate a combined noise level of 81 dB L_{eq} at 50 feet, which would attenuate to the City of Berkeley's noise standard of 75 dB L_{eq} for single-family residences (as shown in Table 3.10-4) at a distance of 87 feet. Homes located along Summit Road and Grizzly Peak Boulevard could be exposed to noise levels that exceed 75 dB L_{eq} when mechanical treatment activities and chipping/mastication of biomass occur within 135 feet.

East-West FB

East-West FB would be located close to a residential community along the southwest boundary of the Plan Area that lies within the Cities of Berkeley and Oakland, including homes in the Panoramic Hill neighborhood along Panoramic Way and Panoramic Place. The portion of this community within the City of Berkeley is over 1,100 feet from the East-West FB and thus would not experience noise levels exceeding local standards; however, the portion within the City of Oakland is adjacent to some areas of the East-West FB.

The East-West FB would undergo herbicide application, mechanical, and manual treatment activities, and chipping/mastication would likely occur to dispose of a portion of the biomass. As discussed above, herbicide application would not generate excessive noise levels, but the use of manual and mechanical equipment would generate noise levels that could exceed local standards. Mechanical equipment would generate a combined noise level of 81 dB L_{eq} at 50 feet, which would attenuate to the City of Oakland's noise standard of 80 dB L_{eq} for single-family residences (as shown in Table 3.10-6) at a distance of 55 feet. Manual equipment would generate a combined noise level of 91 dB L_{eq} at 50 feet, which would attenuate to the City of Oakland's noise standard of 80 dB L_{eq} for single-family residences at a distance of 135 feet. Homes located along Panoramic Way and Panoramic Place could be exposed to noise levels that exceed local standards when mechanical treatment activities and chipping/ mastication occur within 55 feet and manual treatment activities occur within 135 feet.

Summary

Manual and mechanical treatment activities used to implement the Strawberry FHR and East-West FB and associated chipping/mastication to dispose of biomass could expose residential receptors to noise levels that exceed local standards when such activity occurs within certain distances. Noise levels generated by these activities would fluctuate depending on the distance from the activity to an individual receptor and the equipment used on a given day. The EPMs presented in Section 2.6, "Environmental Protection Measures" would help to minimize these noise levels. The EPMs would require UC Berkeley to limit operation of heavy equipment to daytime hours if noise generated would be audible to sensitive receptors and to pause work during the university's Reading/Review/Recitation Week and finals week (EPM NOI-1); properly maintain all mechanical equipment and hand-operated power tools as well as utilize noise-reducing mufflers and engine shrouds (EPM NOI-2); keep engine shrouds closed during equipment operation (EPM NOI-3); and limit idling of motorized equipment to 5 minutes (EPM NOI-4). As discussed in the program-level analysis for the WVFMP, any increase in noise level at nearby residential receptors would be infrequent and temporary. However, because local noise standards could be exceeded even with the implementation of EPMs, this impact would be **significant.**

Mitigation Measures

Mitigation Measure NOI-1: Notify Residential and Academic Land Uses

At least three days prior to beginning treatment activities or biomass disposal activities using chainsaws, mechanical equipment, or water tenders, UC Berkeley will provide advanced notice to occupants of residential land uses in the City of Berkeley that are within 215 feet of such activity and occupants of residential land uses in the City of Oakland that are within 135 feet of such treatment activity. At 215 feet noise generated by chainsaws (i.e., the loudest piece of equipment) would attenuate to less than 75 dB Leq, which is the City of Berkeley's noise standard for nonscheduled, intermittent, short-term operation of mobile equipment. At 135 feet noise generated by chainsaws (i.e., the loudest piece of equipment) would attenuate to less than 80 dB L_{eq}, which is the City of Oakland's noise standard for construction-generated noise. Because the distance used for notification is based on the distance required to reduce the noise levels associated with the loudest piece of equipment to below local standards, it would be sufficient to also reduce noise levels associated with the lower volume activities and equipment. Additionally, UC facilities and academic land uses within these noise contours will be notified.

Notification will include the dates and hours during which excessive noise generating activities are anticipated to occur and contact information, including a daytime telephone number, of a project representative. Recommendations to assist noise-sensitive land uses in reducing interior noise levels (e.g., closing windows and doors) will also be included in the notification.

Significance after Mitigation:

Overall WVFMP and Identified Treatment Projects

Implementation of Mitigation Measure NOI-1 would provide notification to nearby residents, LBNL and UC Berkeley staff and students of excessive noise generating activities, which would allow those notified to adequately prepare for any noise increases generated during treatment implementation. However, Mitigation Measure NOI-1 would not decrease noise levels at noise-sensitive residences below applicable noise standards. Implementation of Mitigation Measure AQ-1 in Section 3.3, "Air Quality" would decrease noise levels at nearby noise-sensitive receptors when electric-powered chainsaws are used. Electric-powered chainsaws generate less noise compared to gas-powered chainsaws (NPC 2005). However, electric-powered chainsaws would not completely replace gas-powered chainsaws during Plan implementation; therefore, gas-powered chainsaws, along with the other equipment that could exceed local noise standards (e.g., mechanical equipment and water tenders), would be used close to the Plan Area boundary near residences.

There is no additional feasible mitigation that could be implemented to decrease noise levels at receptors. CEQA analyses for projects that include construction activities—in Berkeley, Oakland, and other jurisdictions—have included mitigation measures similar to Mitigation Measure NOI-1 and the EPMs for the WVFMP. One effective and commonly used mitigation strategy for construction-related noise impacts that is not included in the EPMs or Mitigation Measure NOI-1 is requiring the installation of temporary sound barriers between construction activity and sensitive receptors. However, this strategy is not feasible to implement for the WVFMP because of the location, nature, and pace of the treatment work. Installing temporary sound barriers in the Plan Area would often be a hazard to workers, the public, and nearby structures or buildings because the Hill Campus is mostly composed of hilly, vegetated, and undeveloped terrain, and they could inhibit wildlife movement in the area. Additionally, temporary sound barriers would be a safety hazard during certain activities such as prescribed burning, where ease of movement are of utmost importance for the safety of workers and the local community.

Establishing a distance (setback) from residences within which noise generating treatments would not occur or within which hand-operated power tools and heavy equipment would not be used is another potential mitigation strategy. However, prohibiting or reducing the effectiveness of treatments near residences would prevent UC Berkeley from accomplishing the primary objective of the proposed WVFMP, which is to substantially reduce risk to life and property from wildfire. Therefore, this mitigation strategy is not feasible.

Mitigation Measure NOI-1 would decrease the magnitude of noise impacts at residential receptors located close to the Plan Area by informing residents and allowing them time to make accommodations to decrease noise exposure. However, because there is no additional feasible mitigation that would decrease noise exposure at nearby residences such that local noise standards would not be exceeded, this impact, for both the overall WVFMP and Identified Treatment Projects (Strawberry FHR and East-West FB) would be **significant and unavoidable.**

3.11 RECREATION

This section evaluates the effects of WVFMP implementation on recreation in the Plan Area. The analysis includes a description of the existing environmental conditions including applicable regulatory requirements, the methods used for assessment, and the potential direct and indirect impacts of program implementation related to recreation.

Comments on the Notice of Preparation (NOP) related to recreation included concerns regarding obstacles to access for people with disabilities, and the effects of herbicides on recreationists. Refer to Appendix D for a summary of comments received on the NOP. The potential for the WVFMP to create obstacles to public access is addressed in Section 3.14.3, “Impact Analysis and Mitigation Measures” below. Potential effects to the public, including recreationists, related to use of herbicides are addressed in Section 3.8, “Hazards and Hazardous Materials.”

3.11.1 Environmental Setting

STATE AND REGIONAL RECREATION RESOURCES

California State Parks manages several parks in the vicinity of the Plan Area including Albany State Marine Reserve, Emeryville Crescent State Marine Reserve, and McLaughlin Eastshore State Seashore, which is operated by the East Bay Regional Park District (EBRPD). These parks offer a variety of recreation resources including picnic areas, trails, boating, beaches, fishing, wildlife viewing, surfing, and swimming (California State Parks 2020).

EBRPD operates 73 parks in the urban corridor of Contra Costa and Alameda Counties. EBRPD manages nearly 125,000 acres of parklands with more than 1,300 miles of trails. Amenities and recreational opportunities within EBRPD parks include trails, lakes, shorelines, campgrounds, visitor centers, interpretive and recreation programs, picnic areas, rental facilities, and golf courses (EBRPD 2018).

Siesta Valley Recreation Area, managed by East Bay Municipal Utility District, is nearby the Plan Area. EBRPD-managed regional parks near to the Plan Area include Sibley Volcanic Regional Preserve, and Claremont Canyon Regional Preserve and Tilden Regional Park border the Plan Area:

- Claremont Canyon Regional Preserve includes 205 acres of open space with a trail system but no developed recreation facilities.
- Tilden Regional Park includes 2,077 acres of open space lands, and offers a wide variety of facilities and activities. (UC Berkeley 2004).

The City of Berkeley Parks Recreation & Waterfront Department maintains the city’s recreation areas and facilities including approximately 230 acres of parks, open spaces, playgrounds, recreation centers, swim centers, public gardens, and the Berkeley Marina (City of Berkeley 2003).

UC BERKELEY RECREATION RESOURCES

UC Berkeley manages approximately 30 acres of developed recreational space, including athletic fields and recreational facilities on the Campus Park and in the campus vicinity (UC Berkeley 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 as part of the Strawberry Canyon Recreation Area. The main athletic/recreation facility complex is located on Bancroft Way near Dana Street, and includes:

- Recreational Sports Facility (gymnasiums, racquetball, exercise rooms and equipment)
- Evans Diamond (baseball)
- Edwards Stadium and Goldman Field (track and field, soccer)
- Haas Pavilion (basketball)

- Spieker Pool (swimming and water polo)
- Hellman Courts (tennis)

A second cluster of athletic and recreation facilities is accessible from Bancroft Way at Bowditch Street, and includes:

- Hearst Gymnasium and Pools
- Hearst North Field
- Bancroft Tennis Courts

UC Berkeley recreational facilities in the Adjacent Blocks include:

- La Loma Tennis Courts, La Loma and Hearst Avenues
- Maxwell Family Field (formerly Kleeberger Field), Gayley Road at Centennial Drive
- Memorial Stadium, Piedmont Avenue north of Bancroft Way

UC Berkeley recreational facilities located in the Southside include:

- Channing Tennis Courts, Ellsworth Street and Channing Way
- Golden Bear Tennis Courts, Clark Kerr Campus
- Golden Bear Fields, Clark Kerr Campus
- Golden Bear Recreation Center, Clark Kerr Campus (track, gymnasium, pool)

Additionally, the university owns the 2.3-acre People's Park located in the Southside, which contains grass areas, basketball courts, and community gardens (UC Berkeley 2005).

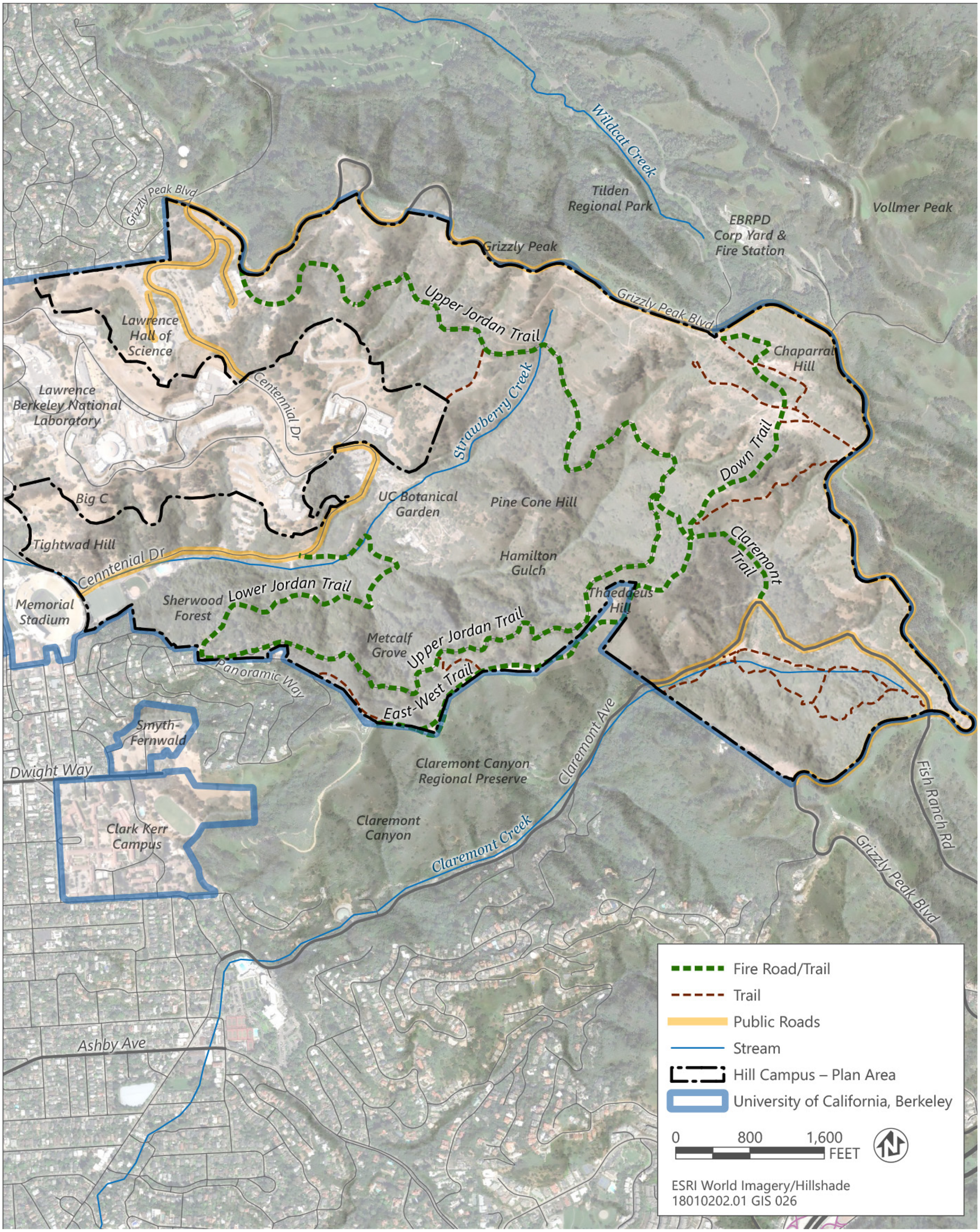
RECREATION RESOURCES IN THE PLAN AREA

The Hill Campus is a scenic and recreational resource for the entire East Bay, and is part of the continuous greenbelt of park and watershed land that extends the length of the East Bay Hills from Richmond to Hayward. A greenbelt of such size and integrity, in such close proximity to densely urbanized areas, is a unique feature of the region and an important component of the quality of East Bay life.

The developed recreation facilities within the Plan Area 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. Undeveloped recreation areas within the Plan Area include a 300-acre Ecological Study Area, Faunal Refuge, Botanical Garden, research open space buffers, and the Chaparral Hill and Claremont Canyon Reserve Study Areas.

The university maintains unimproved dirt fire roads and trails that provide emergency vehicle and maintenance access within the Plan Area, as shown on Figure 3.11-1. The Upper and Lower Jordan Fire Trails are the main unpaved access roads into the Plan Area. These fire trails as well as the East-West Trail are heavily used for recreation and dog walking and connect to adjacent regional parks. The Hill Campus open space areas are used primarily by students and local residents for walking, hiking, running, and dog walking. Additional recreational and educational uses include nature study and wildlife viewing. Many points within the Hill Campus offer views of San Francisco Bay and the Golden Gate Bridge.

UC Berkeley does not manage the Plan Area for recreation and does not have a formal mechanism for tracking recreational users of its lands. The open space areas within the Plan Area are not developed with restrooms, formal parking facilities, or other amenities to accommodate heavy recreational use. 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 the following UC Berkeley lots after work hours and on weekends without charge: Botanical Garden, Lawrence Hall of Science, Space Sciences Laboratory and MSRI. Informal trail parking is limited to about 12 parking spaces off Centennial Drive near the entrance to the Lower Jordan Fire Trail (FEMA 2014).



Source: data downloaded from University of California, Berkeley in 2019

Figure 3.11-1 Trails in the Plan Area

3.11.2 Regulatory Setting

The regulations identified below are applicable at the program and project level, unless otherwise noted.

FEDERAL

There are no federal plans, policies, regulations, or laws related to recreation applicable to the WVFMP.

STATE

There are no state plans, policies, regulations, or laws related to recreation applicable to the WVFMP.

LOCAL

As a constitutionally-created state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies. Following the relevant policies of the UC Berkeley 2020 LRDP, relevant local regulations are summarized below.

UC Berkeley 2020 LRDP

The UC Berkeley 2020 LRDP contains the following objective related to recreation that is applicable to the WVFMP (UC Berkeley 2005):

- Maintain the Hill Campus as a Natural Resource for Research, Education and Recreation, with Focused Development on Suitable Sites.

Alameda County General Plan

The Recreation Plan portion of the Alameda County General Plan contains the following objectives and principles related to recreation that are applicable to the WVFMP (Alameda County 1994):

- Objective: To provide a system of parks and recreation areas for the preservation of historical buildings and unusual physical features, the promotion of health and well-being through the constructive use of leisure time, and the conservation of natural resources.
- Objective: To provide a system of public open spaces of county, metropolitan or statewide significance and recreation use in proper relation to neighborhood, community and other recreation areas serving cities and recreation districts, to other types of land use, to other public services and facilities, and to transportation.
- Principal 2: The parks and recreation areas serving the county as a whole should include:
  - a. Nature areas providing beaches, large inland parks for picnicking, camping, hiking, boating, fishing, swimming, nature study, etc. and other special features of county-wide interest and utilization.
  - c. Special recreation facilities such as small boat harbors, riding and hiking trails within and connecting recreation areas, parkways and scenic drives, roadside rest areas, and cultural recreation facilities such as amphitheaters, auditoriums, bandstands, fairgrounds and museums.
- Principal 4: The physical system of county-wide park and recreation areas and facilities should provide for a full range of active, passive, and cultural recreation activities, serving all age groups, organized activity groups, and serving daytime, overnight camping, weekend and vacation recreational needs.

Contra Costa County General Plan

The Open Space Element of the Contra Costa County General Plan contains the following policies related to recreation that are applicable to the WVFMP (Contra Costa County 2010):

- Policy 9-1. Permanent open space shall be provided within the county for a variety of open space uses.
- Policy 9-7. Open space shall be utilized for public safety, resource conservation, and appropriate recreation activities for all segments of the community.

City of Berkeley General Plan

The City of Berkeley Open Space and Recreation Element contains the following policy related to recreation that is applicable to the WVFMP (City of Berkeley 2003):

- Policy OS-4 Working with Other Agencies. Work with the Berkeley Unified School District, the University of California, the East Bay Municipal Utility District, and the East Bay Regional Park District to improve, preserve, maintain, and renovate their open space and recreation facilities.

City of Oakland General Plan

The Open Space, Conservation and Recreation Element of the City of Oakland General Plan contains the following policy related to recreation that is applicable to the WVFMP (City of Oakland 1996):

- Policy OS-3.1: University, College, and Institutional Open Space. Retain open space at Oakland's universities, colleges, and other institutions where such open space provides recreational, aesthetic, conservation, or historic benefits to the community.

3.11.3 Impact Analysis and Mitigation Measures

ANALYSIS METHODOLOGY

The analysis of environmental impacts on recreation focuses on the potential for substantial physical deterioration of existing facilities, construction or expansion of recreation facilities, and disruption of recreational activities. Significance determinations account for the influence of relevant EPMs, which are incorporated into treatment design; the full text of EPMs is presented in Section 2.6 "Environmental Protection Measures."

SIGNIFICANCE CRITERIA

Thresholds of significance are based on Appendix G of the State CEQA Guidelines and consideration of comments received on the NOP. A recreation impact is considered significant if implementation of the WVFMP would:

- increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated;
- include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment; or
- directly or indirectly disrupt recreational activities within designated recreation areas.

ISSUES NOT EVALUATED FURTHER

The following issues are not evaluated further in the EIR for the reasons summarized below. Refer to the Initial Study in Appendix C of this EIR for additional explanation.

Implementation of the WVFMP would consist of vegetation treatment activities that would modify vegetation in portions of the Plan Area to reduce wildfire risk. Treatment activities would not increase the use of recreational facilities to the extent that substantial deterioration would occur. Typically, this impact occurs when a project induces population growth, such as a new housing or a business that would necessitate a large number of new employees. As discussed in Section 3.1, "Approach to the Environmental Analysis" and Section 5.3, "Growth Inducing Impacts," implementation of the WVFMP would not induce substantial population growth. Therefore, implementation of the WVFMP is not expected to generate employees or increase the population such that substantial physical deterioration of recreational facilities would occur through increased use. This issue is not evaluated further.

Implementation of the WVFMP would not involve the development of residential communities or other similar types of development or induce substantial population growth in an area that would require the construction of or expansion of recreational facilities. As discussed previously, implementation of the WVFMP would not result in substantial relocation of employees. Therefore, construction or expansion of recreational facilities would not be needed to accommodate an increase in employees or population. This issue is not evaluated further.

IMPACT ANALYSIS

Impact REC-1: Directly or Indirectly Disrupt Recreational Activities Within Designated Recreation Areas

Implementation of treatments within the Plan Area could result in potential conflicts with recreationists. Conflicts entail access restrictions or nuisance impacts during treatment including degradation of views, temporary trail closures, noise, dust emissions, and increased traffic that would disrupt the recreational experience. Treatment activities would be temporary and implementation of EPMs would avoid and minimize disruptions to recreation. This impact would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects.

Overall WVFMP

The Plan Area is heavily used for recreation, including the UC Berkeley Botanical Garden and the recreational trail network within the Hill Campus; although these fire roads are not maintained by the university as a formal trail system. People visit these places to walk, run, observe wildlife, and spend time in nature. During active treatments, temporary closures of portions of roadways may be needed to allow cutting and skidding of trees close to the road. Typically, roads would be open before 9:00 am and after 3:00 pm on weekdays and no work would occur on weekends. In some cases, only one lane would need to be closed for a few hours at a time. Fire trails receiving treatments would also be closed to the public as necessary during treatments.

In addition, potential nuisance impacts that could also disrupt recreation may include:

- degradation of scenic resources (e.g., short-term presence of equipment or long-term changes to the landscape) within the viewshed of recreation areas or trails;
- decreased air quality (e.g., smoke, dust) due to prescribed broadcast burning, pile burning, and the use of motorized equipment along unpaved roadways; or
- disruption or disturbance of recreation due to noise.

Potential disruptions and associated mitigation related to scenic resources and air quality are discussed in Section 3.2, "Aesthetics" and Section 3.4, "Air Quality," respectively. Regulatory compliance, EPMs, and mitigation measures, that would minimize these impacts would also reduce disruption of recreation by storing equipment outside of the viewshed of public trails and roadways (EPM AES-1), to the extent feasible, and minimizing smoke dispersion (EPM AQ-1) and visible dust (EPM AQ-2).

Noise generated during vegetation treatments could also disturb recreationists or disrupt recreation activities such as observing wildlife. Manual, mechanical, and prescribed burning treatments would generate the highest noise levels. Treatment activities that would occur near or within recreational land uses would generate noise levels above ambient conditions. However, noise generated by treatment activities would be temporary and localized to the area where noise-generating activity is occurring. Other locations within the 800-acre Plan Area and adjacent open space areas and regional parks would provide ample opportunities for people to enjoy recreational benefits away from those locations where noise-generating treatment activities are taking place. In addition, EPM NOI-2 would require that all mechanical equipment and hand operated power tools be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, when applicable; EPM NOI-3 would require engine shrouds be closed during equipment operation; and EPM NOI-4 would limit equipment idling.

In addition, implementation of EPM AD-2 would require UC Berkeley to update its Facilities Services website and install signage at least one week before disruption or closure of a public roadway or recreation area to notify recreationists so they can avoid the areas of proposed treatments.

Temporary nuisance impacts to recreation would be minimized with implementation of EPMs AES-1, AQ-1, AQ-2, and NOI-2 through NOI-4. In addition, EPM AD-2 would provide notification to recreationists such that they would have the opportunity to use alternate recreation areas during treatment activities, if desired. With implementation of these EPMs, and because any disruptions to recreation would be temporary, this impact would be **less than significant**.

Identified Treatment Projects

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and herbicide application. Identified Treatment Projects would not include prescribed burning. In addition, the Identified Treatment Projects would not include any evacuation support treatments, which are the primary treatment type that would result in trail/road closures. Although occurring less frequently with the Identified Treatment Projects, mechanical treatments could still result in temporary trail closures and temporary disruption to recreation during vegetation removal as described for the overall WVFMP. Temporary air quality impacts associated with prescribed burning would also not occur with the Identified Treatment Projects. The same EPMs described for the overall WVFMP would also apply during implementation of the Identified Treatment Projects. Thus, any temporary disruption of recreation would be the less than described above for the overall WVFMP and this impact would be **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

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3.12 WILDFIRE

This section evaluates the effects of WVFMP implementation on wildfire and wildfire-related risks. The following analysis considers drivers of wildfire risk, and how the proposed treatments could add to such risks or expose people or structures to wildfire risk. This section also provides background and context on wildfire concepts, such as wildfire regime, wildfire behavior, and wildfire management practices. Information used in this section was obtained from scientific journal articles, reports, and relevant fire and emergency-related plans.

Comments on the Notice of Preparation (NOP) related to wildfire included proposed measures to reduce risk of wildfire spread; concerns about vegetation treatments and herbicides increasing flammability; concerns about wildfire risk in the wildland-urban interface (WUI) adjacent to the Plan Area; recognition that wildfire ignitions are often human driven; and acknowledgement that vegetation management, home hardening, and defensible space are all needed to reduce fire risk. Comments on the NOP also included requests to evaluate wildfire under Diablo wind conditions; to provide a map of fire hazard severity zones; to consider evacuation plans, landslides, rate of fire spread, firefighter effectiveness, effectiveness of fuel breaks, and ongoing maintenance; to include Assembly Bill 38 (Statutes of 2019) policies related to wildfire mitigation programs; and acknowledgement that prescribed burning must comply with air quality regulations. Refer to Appendix D for a summary of comments received on the Notice of Preparation. These comments are addressed in Sections 3.12.1 through 3.12.3 below. Non-vegetation treatments (e.g., home hardening) are addressed in Chapter 6, "Alternatives."

3.12.1 Environmental Setting

WILDFIRE BEHAVIOR AND CONTROLLING FACTORS

Wildfire behavior is a product of several variables, primarily weather, vegetation, topography, and human influences, which intermix to produce local and regional fire regimes that affect how, when, and where fires burn. The fire regime in any area is defined by several factors, including fire frequency, intensity, severity, and area burned. Each of these are important for an understanding of how the variables that affect fire behavior produce fire risks. Fire frequency refers to the number of fires that occur in a given area over a given period of time. Fire intensity refers to the speed at which fire travels and the heat that it produces. Fire severity involves the extent to which ecosystems and existing conditions are affected or changed by a fire. Area burned is the size of the area burned by wildfire.

Human Influence on Wildfire

Human influence on wildfire is broad and can be substantial. It includes direct influences, such as the ignition and suppression of fires, and indirect influence through climate change and alterations in land use patterns that support modified vegetative regimes and increased development in the WUI (refer to "Climate Change and Wildfire" below for more discussion on the indirect effect of climate change on wildfire).

Anthropogenic influence more directly controls fire frequency (i.e., number of ignitions) than size of a burn because humans are responsible for most of the ignitions. Once started, fire spread and behavior become a function of fuel characteristics, terrain, and weather conditions (Syphard et al. 2008). Human-induced wildfire ignitions can change fire regime characteristics in two ways: (1) changing the distribution and density of ignitions, and (2) changing the seasonality of burning activity (Balch et al. 2017).

Human ignitions include a multitude of sources, including escapes from debris and brush-clearing fires, electrical equipment malfunctions, campfire escapes, smoking, fire play (e.g., fireworks), vehicles, and arson. Consequently, areas near human development, especially in the WUI or in areas near campgrounds and roads, generate fires at a more frequent rate than very remote or urban areas (Syphard et al. 2007, Mann et al. 2016, Balch et al. 2017).

Climate Change and Wildfire

Wildfires are a significant threat in California, particularly in recent years as the landscape responds to climate change and decades of fire suppression. As climate change persists, it will produce increasing temperatures and drier conditions that will generate abundant dry fuels. All wildfires (those initiated by both natural and manmade sources) tend to be larger under drier atmospheric conditions and when fed by drier fuel sources (Balch et al. 2017).

Additionally, climate change has led to exacerbation of wildfire conditions during a longer period of the year as the spring season has warmed—driving an earlier spring snowmelt, and as winter precipitation has overall decreased (Westerling et al. 2006). Further, wildfire activity is closely related to temperature and drought conditions, and in recent decades, increasing drought frequency and warming temperatures have led to an increase in wildfire activity (Westerling et al 2006, Schoennagel et al. 2017). In particular, the western U.S., including California, has seen increases in wildfire activity in terms of area burned, number of large fires, and fire season length (Westerling et al. 2006, Abatzoglou and Williams 2016). These conditions have resulted in the largest, most destructive, and deadliest wildfires on record in California history, several of which occurred in 2018.

Climate change will continue to produce conditions that facilitate a longer fire season, which, when coupled with human-caused changes in the seasonality of ignition sources, will produce more, longer, and bigger fires during more times of the year. According to California's Fourth Climate Change Assessment, *Statewide Summary Report* (OPR, CEC, and CNRA 2018), if greenhouse gas emissions continue to rise, the frequency of extreme wildfires burning over 25,000 acres could increase by 50 percent by 2100 and the average area burned statewide could increase by 77 percent by the end of the century (Bedsworth et al. 2018). Refer to Section 3.7, "Greenhouse Gas Emissions and Climate Change," for additional discussion of climate change trends and the effects of climate change on the environment.

WILDFIRE RISK REDUCTION

Historically, humans have intervened deliberately and dramatically in the fire regime through fire suppression and, more recently, actions that affect fuel connectivity. Although an important practice in limiting fire spread, over time, the land management practice of fire suppression combined with forest regrowth after extensive logging in the late 19th century has led to a buildup of forest fuels and an increase in the occurrence and threat of large, severe fires (Westerling et al. 2006). Increased wildfire activity has also been found to be strongly associated with warming temperatures and earlier spring snowmelt (Westerling 2016). More extreme fire conditions can be expected in areas where the time between fires has been extended, unless fuels have been reduced by other means. With the expansion of the WUI and the threat that large, severe, intense wildfires pose, fire suppression remains one of the primary management techniques for more than 95 percent of wildfires in the U.S. (Schoennagel et al. 2017). Contemporary fire management practices include fuel management activities that are intended to reduce the intensity and severity of wildfires. Reduced intensity also means that suppression efforts are more likely to be effective and can be conducted more safely in areas where wildfires are unwanted or threaten communities (DOI and USDA 2014).

Vegetation (Fire Fuel) Management

Vegetation treatment is the primary approach to wildfire management because it can reduce the intensity and severity of wildfire, slowing fire movement and creating favorable conditions for firefighting to protect targeted, high-value resources (Carey and Schuman 2003, Prichard et al. 2010). Fire fuel reduction has proven successful where it is targeted at protecting specific resources in limited geographic areas, such as in areas of extreme fire danger or in the WUI (Loudermilk et al. 2014). Areas that are treated often exhibit different fire progression characteristics and reduced fire severity compared to areas that are not treated (Lydersen et al. 2017, Johnson and Kennedy 2019). Reducing fuels through mechanical treatments and prescribed fire have been found to be effective at reducing fire frequency, fire severity, and annual area burned when applied at the landscape scale over an extended period of time (Yeon-Su Kim et al. 2013, Martinson and Omi 2013, Prichard and Kennedy 2014, Tubbesing et al. 2019).

Fuel treatments have been found to be most effective when wildfires are driven by typical weather situations where prevailing seasonal conditions of temperature, soil/fuel, and moisture contents are present. In circumstances where extreme weather conditions exist, such as in cases of extremely low humidity and very high winds, fuel treatments are less effective (Brown et al. 2008), particularly when persistently high winds can blow hot embers over long distances. Where treatments have occurred, the pattern of wildfire progression may be limited in some areas to low-intensity underbrush and surface burning, which can create safe conditions for firefighters to successfully suppress fires in areas near homes or other structures, or around areas of high resource value. Fuel treatments also promote faster forest recovery post-fire by causing less damage to soils and leaving some live vegetation within burn areas (USFS 2009), increasing seedling regeneration (Tubbesing et al. 2019), protecting resources such as soils, wildlife, riparian function, and wetlands (Yeon-Su Kim et al. 2013), and reducing drought related tree mortality (Restaino et al. 2019).

One published literature review found that certain treatments, such as hand or mechanical thinning followed by prescribed fire, or prescribed fire alone, are very effective at reducing wildfire severity, and that related ecological impacts are often neutral to positive (Winford et al. 2015). Another published literature review indicates that fuel treatments reduce fire severity, crown and bole scorch, and tree mortality compared to untreated areas. This finding is most applicable to the combination of thinning (manual and mechanical treatments) and prescribed burn treatments. Increased treatment size and intensity (e.g., number of trees removed) can increase the effectiveness of the treatments. Firefighting effectiveness was also reportedly increased by treatments, due to increased visibility in treated areas, decreased heat and smoke of wildfire, increased penetration of retardant to surface fuels, safe access to the fire, and the ability to quickly suppress spot fires in treated areas (Kalies and Yocom Kent 2016).

WILDFIRE CONDITIONS IN THE PLAN AREA VICINITY

Wildfire Conditions

The East Bay Hills surrounding the Plan Area have been transformed from a native California grassland dominated by perennial bunchgrasses to one dominated by European annual grasses and forbs. The annual plants contribute to the current fuel load because the aboveground biomass dries out and persists into the dry 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 grassland patches within a shrub-tree matrix (FEMA 2014).

The complex mosaic of native and introduced vegetation 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. 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. 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 the East Bay Hills, non-native trees, such as blue gum eucalyptus and Monterey pine, also produce greater fuel loads because the plants themselves are bigger (FEMA 2014).

The existing fire regime for most of the vegetation in the East Bay Hills is considered a Fire Regime IV—a high-severity, stand-replacing regime. The fire risk in this area becomes particularly pronounced during the periodic 1- or 2-day shifts from the normal northwesterly winds to 'Diablo' winds blowing in from the warm, dry regions to the east. Diablo wind fires in the twentieth century have burned more than 10 times the acreage of normal wind condition fires; the wildfires of 1923 (Berkeley Fire) and 1991 (Tunnel Fire) were Diablo wind fires (FEMA 2014).

Wildfire History

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 evidence in vegetation 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 (FEMA 2014).

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. Since 1930, the majority of fires have been human-caused, first from controlled burning for rangeland improvement and more recently from accidental ignitions (FEMA 2014).

Between 1923 and 1998, 11 Diablo wind fires burned 9,840 acres of the East Bay hills, destroying 3,542 homes and killing 26 people, with more than 2 billion dollars in financial loss in current dollars. During the same period, three large west-wind fires burned 1,230 acres of grass, brush, trees, and four homes in the East Bay hills (FEMA 2014).

The 1991 Oakland Tunnel Fire set a record for loss of homes to California wildfire, which has now been surpassed by the 2003 Southern California fires, 2017 North Bay Fires, and the 2018 Camp Fire. Until 2017, the 1991 Tunnel Fire stood as the highest destruction of California homes per acre. For eight decades, the 1923 Berkeley Fire, which burned 130 acres north of the Plan Area, held the California record for the greatest number of structures destroyed by wildfire (584 structures). This fire also burned through the Plan Area and destroyed several structures on the north side of the UC Berkeley campus. Additional smaller fires have also ignited near the Plan Area including, most recently, the Grizzly Fire (FEMA 2014).

The 2017 Grizzly Fire brought to the foreground the need for increased fire safety in UC Berkeley's Hill Campus. This fire occurred August 2, 2017, during a hot, but generally windless day. Despite the moderate weather, the fire burned 20 acres and required involvement of 14 agencies in its suppression. The potential risk to public safety was illustrated by the required evacuation of four international laboratories, the public UC Botanical Garden, as well as seven children's summer camps. The potential for business disruptions and property damage was evident as it burned near PG&E transmission lines, which are critical infrastructure providing the sole source of power to LBNL and the UC Berkeley Campus Park (FEMA 2014).

WILDFIRE CONDITIONS IN THE PLAN AREA

Vegetation Conditions

The vegetation communities in the Plan Area include oak bay woodland, coniferous forest, eucalyptus forest, scrub, and successional grasslands. Vegetation treatments would occur in all of the vegetation communities within the Plan Area, but would focus on removal of vegetation that poses a high fire hazard such as eucalyptus.

In its native landscape, Tasmanian blue gum eucalyptus, 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. The leaves of the blue gum eucalyptus have a high content of volatile oils. Although the heat of combustion of various eucalyptus species is similar to those of typical North American species, eucalyptus oil burns much hotter. The combination of litter build-up and high oil content in this vegetation community results in easily ignited and high-intensity fires. Species that produce oily resins, such as blue gum, have also been characterized as far more ignitable than those that do not. On a scale of 1 to 10 for ignition potential, with 1 representing species most easy to ignite and 10 being the most difficult, blue gum scored 1 to 2 (i.e., very high ignition potential). For comparison, oak/bay woodland received a score of 6 to 8, redwood 8, scrub vegetation 4 to 8, and annual grassland vegetation 1 to 3. Overall, blue gum has a high fire hazard rating in comparison with native tree species, which have low to moderate ratings (EBRPD 2009).

Eucalyptus 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). During a fire, the embers and firebrands from a burning eucalyptus tree are known to be cast long distances and have been found to start new fires more than 0.5-mile away. Flame lengths between 6 and 21 feet are expected in a surface fire (EBRPD 2009).

The spotting potential of Eucalyptus forests is unparalleled in terms of both density and distance as a result of the abundance and aerodynamic properties of the tree bark. Eucalyptus bark falls and creates a deep layer of combustible litter that decomposes very little, which may also contribute to crown fire under mild conditions (EBRDP 2009).

Topography

The Hill Campus has steep topography with more than 75 percent of the area with slopes over 40 percent, and more than 90 percent of the Hill Campus with slopes over 20 percent. Areas with slopes under 20 percent are scattered throughout the Hill Campus, often in locations not served by either roads or utilities.

Hazard Ranking

The California Department of Forestry and Fire Protection (CAL FIRE) has mapped Fire Hazard Severity Zones (FHSZs) for the entire state. FHSZs are based on an evaluation of fuels, fire history, terrain, housing density, and occurrence of severe fire weather and are intended to identify areas where urban fires could result in catastrophic losses. FHSZs are categorized as: Moderate, High, and Very High. According to CAL FIRE's Fire Resource Assessment Program FHSZ Geographic Information System data, the Plan Area is located entirely within and surrounded by a Very High FHSZ (VHFHSZ) (Figure 3.12-1).

Fire Behavior Modeling

Information on fire behavior modeling is summarized from the Hill Campus Wildland Vegetative Fuel Management Plan, prepared by Wildland Resource Management and presented in Appendix A. The FlamMap fire behavior prediction model was used to calculate the wildfire hazard for the Plan Area based on predicted flame length, crown fire activity, and ember cast of the vegetation types. The results consider topographical, fuel, and weather conditions and provide fire behavior predictions for the current vegetation communities and conditions in the Plan Area. The results also include 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. These modeling results help to inform the locations and types of vegetation treatments proposed for the Plan Area.

To evaluate fuel conditions, UC Berkeley used data from the Landscape Fire and Resource Management Planning Tools Project (LANDFIRE Version 1.40), a nationally-accepted and consistent mapping of fuel models and FBFM40 (the Scott and Burgan expanded 40 fuel models). Surface fuel models within the Plan Area are discussed in more detail in Appendix A. Refer to Figure 2-2 in Chapter 2, "Project Description" and maps presented in Appendix A for place names used in this section.

Fire Behavior Analysis

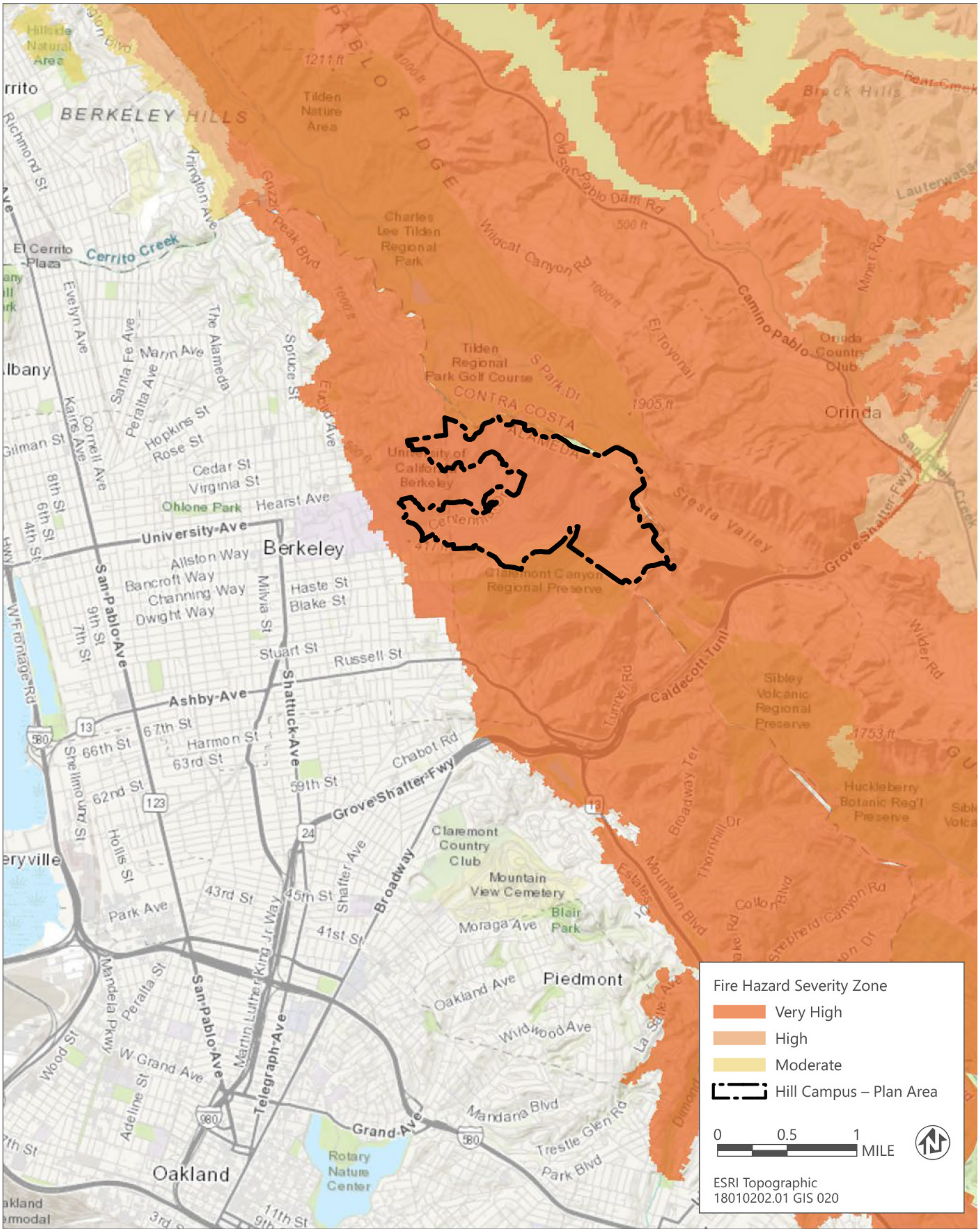
Two weather scenarios were selected for this analysis: 1) Upslope 20 miles per hour (mph) Winds Scenario (portrays conditions with 20 mph winds that blow upslope in all locations), and 2) Northeast 40 mph Winds Scenario (portrays conditions with 40 mph winds from the northeast). The Upslope 20 mph Winds Scenario approximates conditions under which a wildfire burns with a westerly influence, and when fuels are a dominant influence.

Upslope 20 mph Winds Scenario

Flame Length

Under the 20 mph Wind Scenario, modeling results show that almost half (331 acres) of the Hill Campus has conditions conducive to fire with flames greater than 8 feet, indicating direct fire attack methods (i.e., ground firefighting with fire crews) would not be appropriate, and that indirect suppression (e.g., aerial firefighting) would be necessary. Approximately 220 acres of the Plan Area are estimated to burn with flames between 4 and 8 feet in length, and approximately 37 acres in area are estimated to burn with low flames lengths (i.e., shorter than 4 feet). The remainder of the Plan Area is not expected to carry fire, due to the lack of adequate vegetative fuel.

Long flame lengths are associated with forested areas with a dense understory of shrubs and short trees, as well as in stands of thick, dense shrubs. The areas of longest flame length are located in the portion of the Plan Area with higher elevations: northeast of LBNL, surrounding the UC Botanical Garden, throughout Hamilton Gulch, as well as in Claremont Canyon. Areas with shorter flame lengths are located where a dense forest canopy is combined with a thin leaf litter. These areas are found in the western portion of the Plan Area: in lower Strawberry Canyon, in the Botanical Garden, on the southern side of Claremont Canyon, and atop Chaparral Hill.



Source: data downloaded from University of California, Berkeley in 2019 and CALFIRE in 2016

Figure 3.12-1 Fire Hazard Severity Zones

Rate of Fire Spread

Fast-moving fires are those where the rate of spread is greater than 20 mph. Under the 20 mph Wind Scenario, approximately 282 acres of the Plan Area are in this category of spread rates. These fast-moving fires could occur north of the Botanical Garden, north of Claremont Avenue, and on the west-facing slope of Frowning Ridge.

The potential rate of fire spread in almost 300 acres of the Plan Area is characterized as slow to moderate. Areas expected to have a slower spread rate are found in lower Strawberry Canyon, south of Claremont Avenue, and on Chaparral Hill.

Crown Fire Activity

While only 22 acres in the Plan Area have conditions conducive to canopy-to canopy fire spread under the 20 mph Wind Scenario, more than 300 acres have conditions where torching would be likely, consuming the tree canopy and producing and distributing embers during a fire. Approximately 390 acres of the Plan Area have conditions where a fire would occur as a surface fire.

Surface fire conditions are predicted in lower Strawberry Canyon, around Lawrence Hall of Science, the Botanical Garden and lands east, the shrubby slopes of Frowning Ridge, the northwestern portion of the Plan Area in Claremont Canyon, Chaparral, Hill, and on the north-facing slopes between the Lower and Upper Jordan Fire Trail. These areas lack sufficient density of trees and such areas without trees cannot torch or produce canopy fires. Areas northeast of LBNL to Grizzly Peak Boulevard, the upper slopes of Hamilton Gulch, and portions of Claremont Canyon have a high potential for torching. Minor ridgelines between Lower Jordan Fire Trail and the southern boundary of the Plan Area also have conditions conducive to torching. Canopy fire is expected to be rare and, if it occurs, would take place in small patches sprinkled throughout the Hill Campus.

Maximum Spotting Distance

Under the 20 mph Wind Scenario, the longest maximum spotting distance (i.e., maximum distance embers can travel ahead of a fire and ignite spot fires) would be between 1,000-2,000 feet, and would occur above the eastern portion of LBNL. Long-distance spotting is also predicted to occur in Hamilton Gulch, south of the Botanical Garden, and along the southern boundary of the Plan Area in Claremont Canyon. A small area of potential long-distance spotting is located on Stadium Rim Way, close to the Campus Park.

Northeast 40 mph Winds Scenario

Flame Length

With a very strong wind (40 mph) blowing from the northeast, more than half (411 acres) of the Hill Campus has conditions conducive to fire with flames greater than 8 feet. This is almost a third more acreage than with a 20 mph Wind Scenario. Flame lengths between 4 and 8 feet are likely for approximately 137 acres, and approximately 24 acres are estimated to burn with flames lengths shorter than 4 feet under this modeling scenario. Approximately 174 acres of the Plan Area are not expected to carry fire due to the lack of adequate vegetative fuel.

Under this modeled scenario, projected flame lengths longer than 8 feet are widespread in the upper reaches of the Hill Campus, whereas flames less than 4 feet in length are common in western portion of Strawberry Canyon, the Botanical Garden, Chaparral Hill, and in portions of Claremont Canyon.

Rate of Fire Spread

High rates of fire spread are associated with both unmowed grasslands, and in stands of tall, dense shrubs. Approximately 429 acres within the Plan Area have conditions conducive to burning at a high rate of speed under the 40 mph Wind Scenario, which is almost double the acreage projected under the 20 mph Wind Scenario. Another 157 acres have conditions conducive to moderate spread rates.

The patterns of spread rates are similar to the 20 mph Wind Scenario, with slower spread rates found in lower Strawberry Canyon, at the Botanical Garden, and Chaparral Hill. Areas north of the Botanical Garden, north of Claremont Avenue, and on the west-facing slope of Frowning Ridge have a higher potential for fast-moving fires compared to other areas of the Plan Area. Under this modeled scenario fire in areas above Upper Jordan Fire Trail and in Claremont Canyon spread faster with a northeast wind compared to other wind directions.

Crown Fire Activity

The acreage predicted to burn with canopy-to canopy fire spread under the 40 mph Wind Scenario is four times (82 acres) what is expected compared to a 20 mph Wind Scenario. Less area (251 acres) is expected to torch under this scenario. The area where surface fires are expected under this scenario is similar to the 20 mph Wind Scenario. Thus, the greatest difference in this scenario, is from fires torching to spreading from canopy-to-canopy during a wildfire.

Surface fires continue to be predicted in the same locations as in the 20 mph Wind Scenario, likely because of a lack of trees. Torching could occur northeast of LBNL's Strawberry Gate to Grizzly Peak Boulevard, upper slopes of Hamilton Gulch, and portions throughout Claremont Canyon. Minor ridgelines between Lower Jordan Fire Trail and the southern boundary of the Plan Area have vegetation conditions conducive to torching. Canopy fire is still predicted to occur in small patches; however, the patches under this scenario are larger, and located in the Field Station for the Study of Behavior, Ecology, and Reproduction (FSSBER), northeast of the Botanical Garden, west of Thaddeus Hill, and in Claremont Canyon both north and south of Claremont Avenue.

Maximum Spotting Distance

Under the 40 mph Wind Scenario greater maximum spotting distances are predicted as a result of the higher modeled wind speed. The number of acres with 2,000 feet or more maximum spotting distance increased to 105 acres under this modeling scenario. Areas of long-distance spotting potential are different with a different wind direction. For example, there is no spotting predicted on Tightwad Hill. However, long-range spotting potential occurs above the Upper Jordan Fire Trail, northeast of the LBNL Strawberry Gate, and in Claremont Canyon northwest of signposts 27 and 28.

PAST AND CURRENT VEGETATION TREATMENTS

As described in Chapter 2, "Project Description," UC Berkeley maintains an approved and ongoing program of vegetation treatment and maintenance activities in the Plan Area to reduce fire risk to the plan and surrounding areas. Past, ongoing, and planned vegetation treatments described in the existing 2020 Hill Area Fire Fuel Management Program include defensible space and roadside treatments; evacuation support treatments; roadside turnout and signpost treatments; exotic plant removal; hazard tree removal; and tree planting (i.e., replacing flammable vegetation with more fire-resistant vegetation). These ongoing activities have been addressed in the UC Berkeley *2020 Long Range Development Plan EIR* (State Clearinghouse No. 2003082131). These activities are described in the Plan (refer to Appendix A) but have already been reviewed under CEQA and are therefore not part of the proposed project that is analyzed in the EIR. Rather, these ongoing activities are described as part of the environmental setting as it pertains to wildfire.

Past Vegetation Treatments

UC Berkeley has managed the Plan Area for fire hazard reduction for decades. The 1980s saw a combination of treatments in Strawberry Canyon that spanned prescribed burns, goat grazing, eucalyptus removal, and forest thinning with hand crews. In the 2000s, efforts focused on eucalyptus removal in Claremont Canyon.

More recently, UC Berkeley Facilities Services has planned for and undertaken regular vegetation treatment activities in the Plan Area, including:

- Remove dead trees and hazardous trees or limbs that pose an imminent public safety risk;
- Remove vegetation along 100 feet of either side of roadways and trails to maintain emergency evacuation access;
- Provide defensible space, by removing vegetation within 100 feet of all structures consistent with PRC 4291; and
- Remove vegetation along a 15-foot strip of land adjacent to roads and near property boundaries, and a 50-foot radius of designated turnouts along Grizzly Peak Boulevard and Claremont Avenue.

Typically, vegetation treatment activities carried out by Facilities Services is implemented by hand crews using hand-held tools, with occasional use of machinery to cut grass and shrubs and to chip woody material. Herbicide is applied by hand-held tools to roadside vegetation; however, it is currently limited in its use. Removal of exotic plants occurs in areas previously treated. In recent years, Facilities Services has replaced hazardous Monterey pine trees with fire-resistant trees, shrubs, and grasses within the Plan Area on an area known as Tightwad Hill. In addition, the Claremont Canyon Conservancy, UC Berkeley Forestry Club and a local non-profit, Take to The Hills, have participated in maintaining the Plan Area through removal of flammable exotic invasive species and planting less flammable species.

In addition, some past vegetation treatments have focused on removal of eucalyptus. Some eucalyptus stands within the Plan Area have been treated three times, most have been cut twice, whereas some small stands of eucalyptus have never been removed. Re-sprouting has occurred in most eucalyptus stands cut before 2005.

In 1974 a multi-jurisdictional fuel break that covered the East Bay Hills was created that focused on removing eucalyptus trees that were top-killed from a freeze in 1973. Almost all of the eucalyptus trees that were cut have re-sprouted. Approximately 50 acres of the eucalyptus sprouts were cut again between 1988 and 1991 in Strawberry Canyon and on top of Chaparral Hill. Most of the eucalyptus trees in Strawberry Canyon re-sprouted.

Approximately 90 acres of eucalyptus sprouts in Claremont Canyon were cut between 2005–2006, with no re-sprouting as a result of effective herbicide application.

In addition, hazard trees were felled as necessary between 1974 and 2019. Most recently, hazard trees around one building in the FSSBER were felled in 2019, and trees that might block evacuation and access along a swath 100-feet on both sides of Centennial Drive, were removed in 2019–2020.

Current Vegetation Treatments

As a response to funding received by CAL FIRE California Climate Investments Forest Health Grant, Facilities Services is expanding its vegetation treatment and maintenance activities in the Plan Area that are covered by the 2020 LRDP EIR to include treatments to improve emergency access and evacuation support.

Current vegetation treatments include defensible space creation and maintenance, roadside treatments, turnout treatments, flammable exotic plant removal and maintenance, as well as evacuation support. Generally, treatments occur annually, however the evacuation support treatments have been limited by funding. Appendix A includes a detailed discussion of current vegetation treatments and existing standards for those treatments.

PRESCRIBED BURN PLANNING AND IMPLEMENTATION

Prescribed burning, including both broadcast burning and pile burning, is a tool for fire fuel management that has been used historically within the Plan Area. Implementing a prescribed burn requires extensive planning, including the preparation of prescription burn plans, smoke management plans (SMPs), site-specific weather forecasting, environmental considerations, and ultimately, favorable meteorological conditions which dictate whether a planned burn can move forward on a given day. These planning efforts are described in more detail below.

Planning a Prescribed Burn

This section describes the planning efforts required for planning prescribed burning activities. Areas proposed for prescribed burning are typically identified at the beginning of each season. Prescribed burning often occurs in spring, fall, and winter, depending on weather conditions. Typically, prescribed burns use existing roads and trails as fire containment lines, otherwise fire containment lines are constructed using manual or mechanical treatments before burning to help prevent the accidental escape of fire.

Many factors are considered when deciding to use prescribed broadcast burning to treat an area, including, but not limited to:

- risk to human life and structures and public and private property;
- land use;

- weather conditions;
- soil stability and soil type;
- slope and aspect;
- vegetation types and density;
- fuel moisture content;
- time of year;
- fire return interval; and
- efficacy of alternative treatment methods.

Burn Plan Prescription

Once areas suitable for prescribed burning are selected, prescriptions (e.g., wind direction, humidity, weather conditions) are developed in conjunction with modeling in a program such as BEHAVE to provide specific parameters for burning. The goal is to conduct understory burns which are safer and minimize long-term damage to vegetation.

Specific treatment details are described in a prescription burn plan, which incorporates input from the Bay Area Air Quality Management District (BAAQMD). Contents of a prescription burn plan also include the date, location, and description of the area in detail, prescriptive weather requirements, fire behavior modeling, the ignition plan (including technique, time of day, and mop-up), a contingency plan, and the SMP.

Smoke Management Plan

Smoke management planning is an integrated state and local effort. Before obtaining BAAQMD permission to burn, UC Berkeley must complete the following steps:

- register its burn with the BAAQMD,
- obtain a BAAQMD burn permit,
- submit a SMP to BAAQMD, and
- obtain BAAQMD approval of the SMP.

The SMP specifies the "smoke prescription," which is a set of air quality, meteorological, and fuel conditions needed before burn ignition may be allowed. Depending on the size and complexity of the burn, the SMP will contain information such as nearby population centers, acceptable burn ignition conditions, contingency planning, burn monitoring procedures, smoke travel projections (including maps), smoke minimization techniques, and public notification procedures. Once BAAQMD reviews and approves all of the burn requirements, including the burn permit and SMP, UC Berkeley may begin making the final preparations for the burn. This includes putting into place all of the resources needed to conduct the burn, posting public notices, and obtaining final BAAQMD authorization to burn. UC Berkeley may contact BAAQMD up to 96 hours before the desired burn time to obtain California Air Resources Board (CARB) or BAAQMD forecasts of meteorology and air quality needed to safely conduct the burn. UC Berkeley would continue to work with BAAQMD and CARB until the day of the burn to update the forecast information. BAAQMD authorization to conduct a prescribed burn is provided no more than 24 hours before the burn.

Executing a Prescribed Burn

As described in Chapter 2, "Program Description," equipment onsite during a prescribed burn typically includes 1-2 fire engines, an onsite water tender for fire suppression, and ignition devices such as drip torches. If conditions ever deviate from the burn plan (also called "going out of prescription") (e.g., winds change direction, humidity decreases), the burn is rescheduled, and the crews transition from active burning activities to patrolling and/or extinguishing. In the event a prescribed burn goes beyond the perimeter of its planned area, the crew on-site works to control the escape.

After the prescribed burn, activities include extinguishing any smoldering material along a fires' edge, ensuring logs and debris cannot roll across the fire line, making sure all burning fuel is burnt out or is spread or buried to avoid sparks traveling, and clearing all sides of the fire containment line of snags, rotten logs, stumps, singed brush, and low hanging limbs of trees. Crews monitor the area until the fire is completely extinguished.

EMERGENCY ACCESS

Centennial Drive, aligned east-west, serves as the primary emergency access to and a major evacuation route from the Plan Area to the west, as well as private residences and research institutes. Unimproved dirt fire trails also provide emergency vehicle access within the Plan Area. These fire trails include the East-West Trail and Upper and Lower Jordan Fire trails. Upper Jordan Fire Trail serves as the primary alternative emergency evacuation route for the Panoramic Hill neighborhood to the south, with 404 structures and a population of almost 1,000 residents. Centennial Drive is the primary emergency evacuation route for the 1,048 structures (day-time population 2,081) in the residential area to the north of the Plan Area and has been designated by the Berkeley Fire Department as one of only three major evacuation routes for approximately 1,900 Berkeley residents.

3.12.2 Regulatory Setting

The regulations identified below are applicable at the program and project level, unless otherwise noted.

FEDERAL

There are no federal plans, policies, regulations, or laws related to wildfire applicable to the WVFMP.

STATE

Board of Forestry and Fire Protection

The Board of Forestry and Fire Protection (Board) is a Governor-appointed body within CAL FIRE. It is responsible for developing the general forest policy of the state, determining the guidance policies of CAL FIRE, and representing the state's interest in federal forestland in California. Together, the Board and CAL FIRE work to carry out the California Legislature's mandate to protect and enhance the state's unique forest and wildland resources.

The Board is charged with developing policy to protect all wildland forest resources in California that are not under federal jurisdiction. These resources include major commercial and non-commercial stands of timber, areas reserved for parks and recreation, woodlands, brush-range watersheds, and all private and state lands that contribute to California's forest resource wealth. In addition, the Board is responsible for identifying VHFHSZ in the SRA and LRA. Local agencies are required to designate, by ordinance, VHFHSZs and to require landowners to reduce fire hazards adjacent to occupied buildings within these zones (Government Code Sections 51179 and 51182). The intent of identifying areas with very high fire hazards is to allow CAL FIRE and local agencies to develop and implement measures that would reduce the loss of life and property from uncontrolled wildfires (Government Code Section 51176). The Plan Area is designated as a VHFHSZ.

CAL FIRE

CAL FIRE is the California Department of Forestry and Fire Protection. It is dedicated to the fire protection and stewardship of over 31 million acres of the state's privately-owned wildlands. PRC Section 4291 gives CAL FIRE the authority to enforce 100 feet of defensible space around all buildings and structures on non-federal SRA lands, or non-federal forest-covered lands, brush-covered lands, grass-covered lands, or any land that is covered with flammable material. The PRC, beginning with Section 4427, includes fire safety statutes that restrict the use of equipment that may produce a spark, flame, or fire; require the use of spark arrestors on construction equipment with internal combustion engines; specify requirements for the safe use of gasoline-powered tools in fire hazard areas; and specify fire suppression equipment that must be provided on site for various types of work in fire-prone areas. The WVFMP is being funded through a CAL FIRE grant and these requirements would apply to WVFMP treatments.

2018 State of California State Hazard Mitigation Plan

The State Hazard Mitigation Plan represents the state's primary hazard mitigation guidance document that includes discussions on wildfire and structural fire hazards and provides a mitigation plan for an effective wildfire suppression plan. The Plan also includes goals and objectives related to reducing risks associated with wildfire. The WVFMP would be consistent with the Plan's objective to reduce repetitive property losses due to fire (CalOES 2018).

Executive Order B-52-18

On May 10, 2018, in response to the changing environmental conditions and the increased risk to California's citizens, California Governor Brown issued Executive Order (EO) B-52-18 to support the state's resilience to wildfire and other climate impacts, to address extensive tree mortality, increase forests' capacity for carbon capture, and to improve forest and forest fire management. The EO requires the California Natural Resources Agency, in coordination with the Board, CAL FIRE, and other agencies, to increase the pace and scale of fire fuel treatments on state and private lands. EO B-52-18 commits $96 million in additional state funds for these efforts and calls for doubling the land actively managed through vegetation thinning, prescribed burning, and restoration from 250,000 to 500,000 acres per year to reduce wildfire risk. The WVFMP would contribute to the vegetation treatment acreage goals under EO B-52-18.

Senate Bill 1260

On February 15, 2018, Governor Brown signed SB 1260, which aims to help protect California communities from catastrophic wildfire by improving forest management practices to reduce the risk of wildfires in light of the changing climate. It recognizes that prescribed burning is an important tool to help mitigate and prevent the impacts of the wildfire and includes provisions that encourage more frequent use of prescribed fire in managing California's forest lands. Use of prescribed burning under the WVFMP would contribute to the goals of SB 1260.

Assembly Bill 38

On October 2, 2019, Governor Newsom signed Assembly Bill (AB) 38 related to fire safety. It states that developed areas need to carry out comprehensive urban vegetation management programs to reduce vegetation wildfire fuel loads within developed areas. AB 38 further states that comprehensive wildlands vegetation management, responsive to the widely varying vegetation conditions throughout California, is required to reduce vegetation wildfire fuel loads, in relation to the flammability of different vegetation types, to the maximum extent feasible to prevent or severely limit the spread of wildfires. It also states that measures for safe wildland access for firefighters need to be included in planning to the maximum extent feasible. The WVFMP is consistent with the requirements of AB 38 to carry out a comprehensive vegetation management program that includes measures for safe firefighter access.

LOCAL

As a constitutionally-created state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies. Following the relevant policies of the UC Berkeley 2020 LRDP, relevant local regulations are summarized below.

UC Berkeley 2020 LRDP

The UC Berkeley 2020 LRDP (UC Berkeley 2005) contains the following policy related to wildfire that is applicable to the WVFMP:

- Policy: Manage the Hill Campus landscape to reduce fire and flood risk and restore native vegetation and hydrology patterns.

Alameda County General Plan

The Open Space and Safety Elements of the Alameda County General Plan contain the following principle and policy related to wildfire that are applicable to the WVFMP (Alameda County 2014):

- **The Open Space Plan should**: Protect open space areas from hazards of fire.
- **Policy P11**. The County shall require that open space within developed areas be designed and maintained to minimize fire hazards and ensure compatibility between development and any significant biological resources.

Alameda County Community Wildfire Protection Plan

The Alameda County Community Wildfire Protection Plan (CWPP) provides a comprehensive analysis of wildfire hazards and risks, and identifies proposed projects to reduce the risk of wildfire in the wildland-urban interface areas of Alameda County. The CWPP prioritizes vegetation treatment projects in the Plan Area (Alameda County 2015).

Contra Costa County General Plan

The Public Facilities/Services Element of the Contra Costa County General Plan contains the following policy related to wildfire that is applicable to the WVFMP (Contra Costa County 2010):

- **Policy 7-80**. Wildland fire prevention activities and programs such as controlled burning, fuel removal, establishment of fire roads, fuel breaks and water supply, shall be encouraged to reduce wildland fire hazards.

City of Berkeley General Plan

The Disaster Preparedness and Safety Element of the City of Berkeley General Plan contains the following policy and associated action related to wildfire that are applicable to the WVFMP (City of Berkeley 2003):

- **Policy S-23 Property Maintenance** Reduce fire hazard risks in existing developed areas by ensuring that private property is maintained to minimize vulnerability to fire hazards.
  - **Action A**. Continue and expand existing vegetation management programs.

City of Oakland General Plan

The Open Space, Conservation, and Recreation and Safety Elements of the City of Oakland General Plan contain the following objective and policies related to wildfire that are applicable to the WVFMP (City of Oakland 1996, 2004):

- **Objective CO-10 Vegetation Management.** To manage vegetation so that the risk of catastrophic wildfire is minimized.
- **Policy CO-10.1 Flammable Vegetation Control.** Subject to availability of City resources and at the discretion of the City Council and applicable City departments, control flammable vegetation on public and private open space lands in the Oakland Hills to reduce wildfire hazards.
- **Policy FI-3.** Prioritize the reduction of the wildfire hazard, with an emphasis on prevention.

City of Oakland Draft Vegetation Management Plan

The City of Oakland Vegetation Management Plan includes a framework for managing fuel loads and high hazard vegetation management activities to reduce fired hazard on approximately 1,300 acres within the City of Oakland, including Claremont Avenue and Garber Park located immediately south of the Plan Area (City of Oakland 2019).

3.12.3 Impact Analysis and Mitigation Measures

ANALYSIS METHODOLOGY

The analysis of environmental impacts on wildfire risk focuses on the potential for new or increased risks associated with wildfire, including impairment of an emergency response plan, exposing people or structures to uncontrolled fire, and post-fire risks such as slope instability or landslides. Significance determinations account for the influence of relevant EPMs, which are incorporated into treatment design; the full text of EPMs is presented in Section 2.6 "Environmental Protection Measures."

SIGNIFICANCE CRITERIA

A wildfire-related impact is considered significant if implementation of the WVFMP would:

- impair an adopted emergency response plan or emergency evacuation plan;
- due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire;
- require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment;
- expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes; or
- expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires.

ISSUES NOT EVALUATED FURTHER

The following issues are not evaluated further in the EIR for the reasons summarized below. Refer to the Initial Study in Appendix C of this EIR for additional explanation.

Implementation of the Plan would not locate any new development or land uses within the Plan Area that would require installation of emergency access routes or alter any existing roadways/emergency access routes. Additionally, Plan implementation, especially the evacuation support treatment type, would improve emergency access along major emergency access routes by clearing vegetation prone to torching, including trees that could potentially block access if they were to fall. Therefore, implementation of the Plan would not result in any reduction in the adequacy of emergency access. In addition, as discussed in Chapter 2, "Project Description," UC Berkeley would coordinate with local fire departments to plan emergency access or alternative access to the Plan Area during treatment activities. Therefore, Plan implementation would have no impact on emergency response or evacuation and this issue is not evaluated further.

One of the treatment types proposed includes creating fuel breaks within strategically located areas to support fire-control activities. Because the WVFMP includes the installation of fuel breaks, the associated potential temporary and ongoing impacts to the environment are evaluated throughout Chapter 3 of this EIR. No other infrastructure (such as roads, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment are proposed under the WVFMP. Therefore, this issue is not evaluated further.

The WVFMP does not include any new housing or other land uses where the public would congregate; there would be no new project occupants that could be exposed to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire as a result of the WVFMP. However, there is a risk of exposing existing receptors to smoke from prescribed burning, including when the prescribed burn deviates from the prescription; this is addressed in Impact AQ-2 in Section 3.3, "Air Quality." The potential to expose people to the uncontrolled spread of wildfire by exacerbating wildfire risks while implementing the WVFMP is addressed in Impact WIL-1 below.

IMPACT ANALYSIS

Impact WIL-1: Substantially Exacerbate Fire Risk and Expose People or Structures to Uncontrolled Spread of a Wildfire

Vegetation treatment activities, biomass disposal, and maintenance treatments under the WVFMP could result in risks associated with uncontrolled fire from prescribed burning, as well as from the use of vehicles and heavy machinery in the Plan Area, as each can increase the risk of an accidental wildfire ignition. However, several EPMs would be implemented to reduce the risk of uncontrolled spread of fire from treatment activities and maintenance treatments. In addition, given the extensive preparation and planning before a prescribed burn (e.g., preparation of a SMP and Burn Plan), active monitoring and maintenance during a prescribed burn, and implementation of stringent safety protocols, prescribed burning would not be expected to expose people or structures to the uncontrolled spread of wildfire or otherwise substantially exacerbate fire risk. Furthermore, one of the main objectives of the WVFMP is to reduce the frequency and severity of future uncontrolled wildfire. This impact would be **less than significant** for the overall WVFMP as well as the Identified Treatment Projects.

<u>Overall WVFMP</u>

Vegetation treatment activities, biomass disposal, and maintenance treatments could result in risks associated with uncontrolled fire from prescribed burning (broadcast burning and pile burning), as well as from the use of vehicles and heavy machinery in the Plan Area, as each can increase the risk of an accidental wildfire ignition. The use of mechanical equipment and prescribed burning are analyzed in the following sections. Herbicide use and prescribed herbivory would not increase the risk of uncontrolled wildfire because they would not include the use of equipment that could ignite a fire or the intentional application of fire. In addition, as described in Appendix G of this EIR (Herbicide Risk Assessment), herbicides break down over time, do not persist in the environment, and most pose no risk of flammability such that a substantial risk related to fire would be created.

Mechanical Equipment Use

Sparks from the use of vehicles and heavy machinery in the Plan Area have the potential to ignite surrounding vegetation, exacerbating fire risk and exposing people or structures to uncontrolled spread of wildfire. However, heavy equipment use would not occur during extreme fire danger conditions such as red flag warnings, as posted by local CAL FIRE units. In addition, inspections for fire would be conducted following felling, yarding, and mechanical loading activities occurring during the dry season (EPM WIL-1); machine-powered hand tools would have federal- or state-approved spark arrestors (EPM WIL-2); and tree cutting crews would carry one fire extinguisher per chainsaw and one long-handle shovel and one axe or Pulaski, which would minimize the risk of accidental wildfire ignition. In addition, smoking is not allowed within the Plan Area. Therefore, the presence and use of vehicles and equipment needed to implement treatment activities, biomass disposal, and maintenance treatments would not result in the uncontrolled spread of wildfire or otherwise substantially exacerbate fire risk.

Prescribed Burning

If a prescribed burn in the Plan Area escaped beyond its designated area it would exacerbate fire risk and could expose people or structures to uncontrolled spread of wildfire. As discussed in Section 3.12.1 under "Prescribed Burn Planning and Implementation," implementing a prescribed burn requires extensive planning, including the preparation of prescription burn plans, SMPs, site-specific weather forecasting, posting of public notifications, safety considerations, and ultimately favorable weather conditions so a burn can occur on a given day. Before implementing a prescribed burn, fire containment lines would be established by clearing vegetation surrounding the designated burn area to help prevent the accidental escape of fire. During a prescribed burn, fire engines, a water tender, and safety equipment deemed necessary (e.g., one Pulaski per vehicle) would be on-site. If conditions ever deviate from the burn plan (also called "going out of prescription"), the burn would be rescheduled, and crews transition from active burning activities to patrolling and extinguishing. In the event a prescribed burn goes beyond the perimeter of its planned area, hand crews and fire engines are on-site to control the escape. In addition, a fire suppression resources inventory would be submitted to the local CAL FIRE unit before prescribed burning (EPM WIL-3). Therefore, given the extensive planning and preparation prior to a prescribed burn, active monitoring and maintenance during a burn, and implementation of safety protocols, prescription burning would not expose people or structures to uncontrolled spread of wildfire or otherwise substantially exacerbate fire risk.

In the long term, as one of the primary purposes of the WVFMP, implementation of the treatment activities and maintenance treatments would reduce wildfire risk. Fuel reduction activities would consist of strategic removal of vegetation to prevent or slow the spread of wildfire between structures and wildlands and vice versa. Fuel breaks would create zones of vegetation removal and ongoing maintenance, to help passively interrupt the path of a fire or slow its progress and to support fire suppression by providing responders with a staging area and access to remote locations for fire control actions. Therefore, to the extent the treatments reduce wildfire risk, implementation of the WVFMP would have a beneficial effect by reducing wildfire risk over the long term and would not expose people or structures to uncontrolled spread of wildfire or exacerbate fire risk. This impact would be **less than significant**.

<u>Identified Treatment Projects</u>

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and herbicides. The Identified Treatment Projects would not include prescribed burning. As described for the overall WVFMP, mechanical equipment use could result in temporary risks associated with exposing people or structures to uncontrolled fire. The same EPMs and regulatory requirements as described for the overall WVFMP at the program level would also apply during implementation of the Identified Treatment Projects. One of the primary purposes of the Identified Treatment Projects is to reduce wildfire risk. Thus, the potential for the Identified Treatment Projects to expose people or structures to uncontrolled wildfire or substantially exacerbate fire risk would be similar to that described above for the overall WVFMP. This impact would be **less than significant**.

Mitigation Measures

No mitigation is required for this impact.

Impact WIL-2: Expose People or Structures to Substantial Risks Related to Post-Fire Flooding or Landslides

The WVFMP does not include new housing nor would it result in substantial unplanned population growth. Therefore, it would not place people or structures in an area with risks related to post-wildfire flooding or landslides. Prescribed burning implemented under the WVFMP, including maintenance treatments, would be low severity and typically retain substantial vegetation, thereby maintaining the stability of the soil. In addition, EPMs would be incorporated into treatments to minimize erosion and minimize landslide potential. Therefore, prescribed burning under the WVFMP would not expose people or structures to substantial risks from post-prescribed burning landslides or flooding. The impact would be **less than significant** for the overall WVFMP. Furthermore, one of the primary purposes of the WVFMP is to reduce the frequency and severity of wildfire. The intended wildfire risk reduction achieved with implementation of the WVFMP could also result in a reduction in the associated post-wildfire risk of landslides and flooding.

As with the overall WVFMP, the Identified Treatment Projects would not place people or structures in an area with risks related to post-wildfire flooding or landslides. The Identified Treatment Projects would not include prescribed burning and are also intended to reduce wildfire risk. Therefore, implementation of the Identified Treatment Projects and maintenance treatments would not have the potential to expose people or structures to substantial risks related to post-fire flooding or landslides. There would be **no impact** for the Identified Treatment Projects.

<u>Overall WVFMP</u>

The WVFMP does not include new housing nor would it result in substantial unplanned population growth. Therefore, it would not place people or structures in areas with risks related to post-wildfire flooding or landslides.

As described in Section 3.6, “Geology and Soils,” Impact GEO-2, moderate to high severity wildfire can greatly increase the likelihood of debris sliding and debris flows as well as loss of soil hydrologic function by sealing pores and degradation of soil structure and productivity. As a result, subsequent rainstorms after a wildfire can produce flash floods and debris flows, which can expose people or structures that are located below an area that has burned to substantial risks. However, fires that burn with low severity maintain soil cover, mineralize important nutrients from plant matter stored on the soil surface, reduce fuel loads that could possibly otherwise lead to future high-severity burns, and stimulate the growth of herbaceous vegetation, which helps to facilitate nutrient cycling.

Prescribed broadcast burning under the WVFMP, including maintenance treatments, would be low severity and retain some vegetation, including root systems. Therefore, areas would remain stable post prescribed burning, and no major changes to drainage or runoff would be expected. In addition, EPMs GEO-2, GEO-4, and GEO-5 would be incorporated into treatments under the WVFMP to stabilize disturbed soils from treatments to minimize erosion (EPM GEO-2), drain stormwater via water breaks to reduce stormwater runoff (EPM GEO-4), and require that a registered professional forester or licensed geologist evaluate treatment areas for potential issues with instability and modify treatments to account for instability issues (EPM GEO-5). Pile burning under the WVFMP would be used as a biomass disposal method; however, pile burning would be infrequent and used to dispose of up to 5 percent of the biomass created. In addition, it would be used to burn piles of previously cut vegetation and would not substantially affect root systems of existing vegetation or otherwise destabilize areas. Therefore, prescribed burning under the WVFMP would not expose people or structures to substantial risks from post-prescribed burning landslides or flooding.

With the implementation of EPMs, people and structures would not be exposed to substantial risks from post-fire landslides or flooding with the implementation of the WVFMP, and this impact would be **less than significant**. Furthermore, to the extent the treatments reduce wildfire risk, WVFMP implementation would decrease the risk of landslides and flooding in areas that could otherwise burn in a high-severity wildfire without treatment.

Identified Treatment Projects

The Identified Treatment Projects would involve manual and/or mechanical vegetation treatment activities and herbicides. Identified Treatment Projects would not include prescribed burning. As described for the overall WVFMP, the Identified Treatment Projects would not place people or structures in an area with risks related to post-wildfire flooding or landslides. In addition, because the Identified Treatment Projects would not include prescribed burning and because the primary intent of the treatments is to reduce wildfire risk, there would be no increase in the potential to expose people or structures to substantial risks related to post-fire flooding or landslides. There would be **no impact** for the Identified Treatment Projects.

Mitigation Measures

No mitigation is required for this impact.

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4 CUMULATIVE IMPACTS

4.1 APPROACH TO THE CUMULATIVE EFFECTS ANALYSIS

This section presents an analysis of the cumulative impacts of the WVFMP considered together with other past, present, and probable future projects producing related impacts, as required by Section 15130 of the California Environmental Quality Act Guidelines (State CEQA Guidelines). The goal of such an exercise is twofold: first, to determine whether the overall long-term impacts of all such past, present, and probable future projects are cumulatively significant; and second, to determine whether the WVFMP's incremental contribution to any such cumulatively significant impacts would be "cumulatively considerable" (and therefore significant). (See State CEQA Guidelines Sections 15130[a]–[b], Section 15355[b], and Section 15064[h].

Cumulative impacts are defined in State CEQA Guidelines Section 15355 as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." A cumulative impact occurs from "the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time" (State CEQA Guidelines Section 15355[b]).

The State CEQA Guidelines identify two basic methods for establishing the cumulative environment in which the project is to be considered: the use of a list of past, present, and probable future projects (the "list approach") or the use of adopted projections from a general plan, other regional planning document, or certified EIR for such a planning document (the "plan approach"). This analysis considers both the list and plan approach.

4.1.1 Geographic Scope

Impacts of the WVFMP would occur within and proximate to treatments implemented on approximately 200 treated acres annually within the UC Berkeley Hill Campus (Plan Area or Hill Campus). The Hill Campus is located in the hills adjoining and east of the UC Berkeley Campus Park and California Memorial Stadium, and is primarily in Alameda County with a small area in unincorporated Contra Costa County. Approximately 85 percent of the Plan Area is located within the City of Oakland; the lower or westernmost portion of the Plan Area lies within the City of Berkeley.

The WVFMP does not include the construction of any new or expanded structures or built facilities, and physical activities would be limited to the vegetation treatment types and treatment activities described in Chapter 2, "Program Description," within the Plan Area. Related projects and plans considered in the cumulative analysis include other activities conducted by entities in the Hill Campus (i.e., UC Berkeley, Lawrence Berkeley National Laboratory [LBNL], and Pacific Gas and Electric Company [PG&E]) that would affect the same resources as the WVFMP in similar ways and activities conducted by other entities outside of the Plan Area that could combine with the effects of the WVFMP to create more substantial effects. The geographic scope for cumulative impact analysis varies depending on the environmental resource topic and is identified in each of the resource sections below.

4.1.2 Timeframe

The timeframe of past, present, and probable future activities was determined as follows:

- Past Activities. Past projects/activities include those occurring before November 20, 2019 (the time that the EIR's Notice of Publication was published). The influence of past activities is reflected in the baseline, which, pursuant to CEQA, reflects "existing conditions" at the time of the NOP [State CEQA Guidelines Section 15125[a]]. A brief context discussing land use changes within the Hill Campus is also included below to further describe past activities.

- **Present Activities**. Projects/activities that are either under construction/being implemented, have been approved for construction and operation/implementation, or are ongoing as of November 20, 2019, through the time of the EIR process.
- **Reasonably Foreseeable, Probable Future Activities**. Reasonably foreseeable future activities include a summary of reasonably foreseeable activities from regional wildfire risk reduction planning documents and other projects which, by their nature, would have impacts that could combine with those from the project to create cumulative effects.

4.2 EXISTING CONDITIONS CONTEXT IN THE HILL CAMPUS INCLUDING PAST ACTIVITIES

The land within the Hill Campus has been shaped by past and ongoing activities that have influenced environmental conditions. This section provides a brief summary of past and ongoing activities that have contributed to (and continue to contribute to) cumulative effects within the Plan Area. As described below, various fire hazard reduction activities including vegetation removal, broadcast burning, and herbicide application have been implemented within the Plan Area since the 1920s, with varying degrees of treatment maintenance. Following the 1923 Berkeley fire, a group of individuals removed fire-damaged eucalyptus and pine trees. In the 1950s water supplies, including water mains and hydrants, were established along major roads traversing the Plan Area.

A more structured approach to fire hazard reduction was initiated in the 1970s. This effort included broadcast burning at 10- or 25-year intervals, manual vegetation clearing, fuel break treatments, and displacement of north coastal scrub with conifers and coast live oak. Herbicide application and prescribed herbivory was also encouraged. In 1978, a 100-foot wide fuel management zone was established along the UC Berkeley boundary in areas adjacent to residential development.

Fire hazard reduction activities continued to take shape on the 1980s. UC Berkeley, in collaboration with EBRPD, began managing the area east of the Clark Kerr Campus in 1983. Activities included manual vegetation clearing, broadcast burning, and prescribed herbivory. In 1984, a Hill Area Task Force recommended vegetation management activities within the Plan Area including eucalyptus sprouts removal, vegetation clearing and pruning, broadcast burning, and establishment of a 100-foot wide buffer zone along UC Berkeley boundary in areas adjacent to private property. In, 1986 a suite of treatments in all vegetation types were proposed throughout the Hill Campus including removal of 13-year-old eucalyptus sprouts, prescribed herbivory across 40 acres, and broadcast burning on five acres. Additionally, coniferous forests were thinned, oak trees were planted in the area south of LBNL and native grass seeds were distributed on Chaparral Hill. These activities were implemented by UC Berkeley until 1991.

In addition to vegetation management modifying the native characteristics of the Hill Campus, other modifications have occurred through the installation of university facilities (e.g., Lawrence Hall of Science, Math Science Research Institute, Space Sciences Laboratory, Haas Clubhouse, Botanical Garden, Strawberry Recreational Facility), the Department of Energy's LBNL, public and private roadways, and overhead electrical transmission and distribution lines. Today, the Hill Campus is characterized by a mix of developed and open-space areas enjoyed by the public for its natural and scenic qualities.

4.3 RELATED PROJECTS AND PLANS

The WVFMP cumulative effects analysis considers those past, present, and reasonably foreseeable probable future activities, projects, and plans that have effects similar to those of the WVFMP, including those within and proximate to the Plan Area that may affect the same resources as the WVFMP. Such activities, projects, and plans include those listed below, each of which is described in the sections that follow.

- UC Berkeley Vegetation and Fire Fuel Management
  - ongoing treatments conducted under the 2020 Hill Area Fire Fuel Management Program (2003)
  - treatments conducted under the UC Berkeley, 2020 Long Range Development Plan (2005)

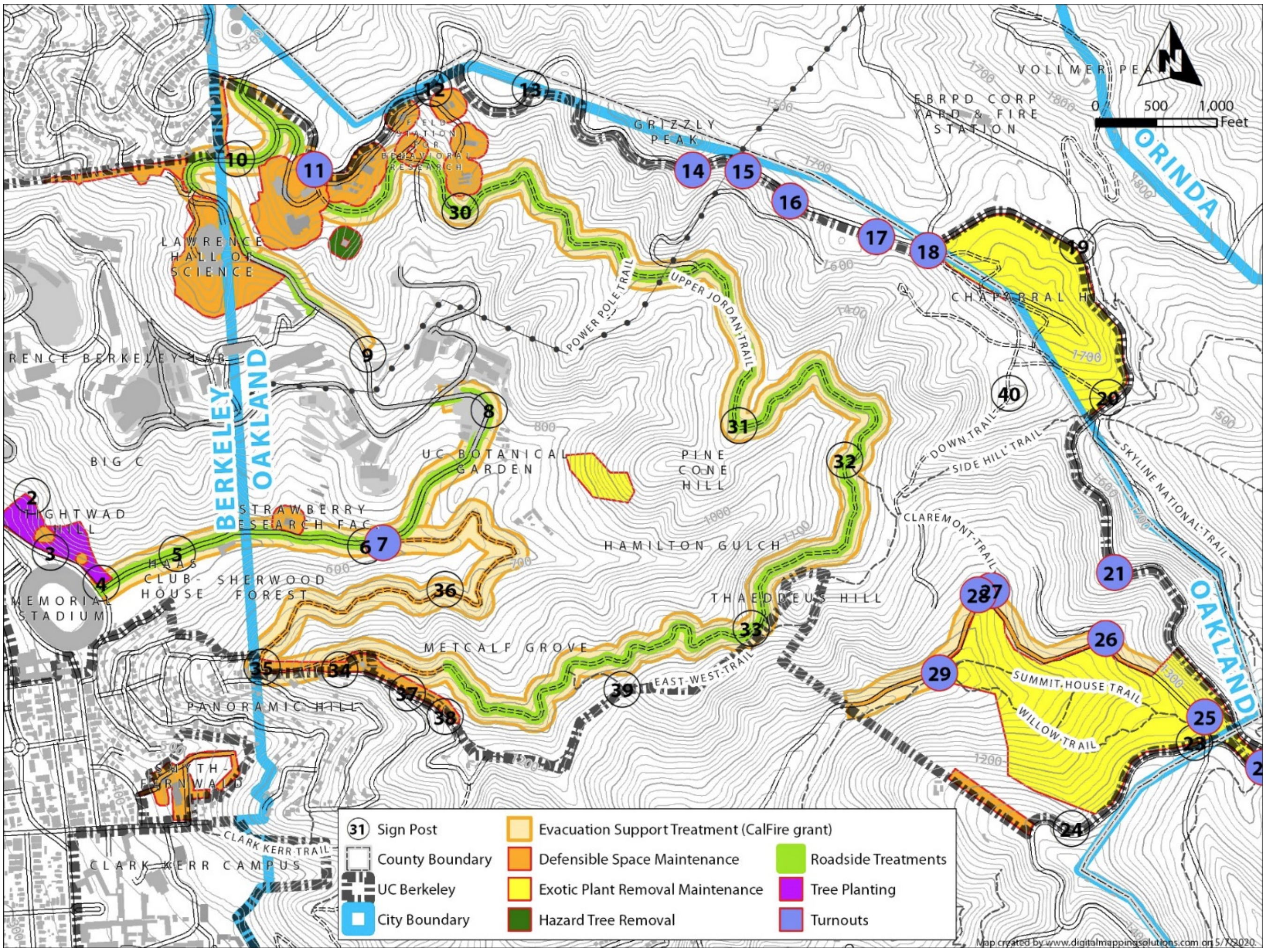
  - evacuation support treatments along Claremont Avenue and Centennial Drive
- Regional Vegetation and Fire Fuel Treatment Programs
  - implementation of Lawrence Berkeley National Laboratory, Federal Wildland Fire Management Plan (2015)
  - hazard vegetation management activities conducted under the City of Oakland, Draft Vegetation Management Plan (2019)
  - implementation of City of Berkeley, Wildfire Evacuation Plan
  - implementation of the Alameda County Community Wildfire Protection Plan (2015)
  - implementation of the East Bay Regional Park District, Wildfire Hazard Reduction and Resource Management Plan (2009)
  - implementation of East Bay Municipal Utility District, East Bay Watershed Fire Management Plan (2000)

4.3.1 UC Berkeley Vegetation and Fire Fuel Management

UC Berkeley maintains an approved and ongoing program of vegetation treatment and maintenance activities in the Plan Area to reduce fire risk to the UC Berkeley campus, LBNL, neighboring residents, recreational visitors, and to adjacent park and watershed lands. Past, ongoing, and planned vegetation treatments described in the existing 2020 Hill Area Fire Fuel Management Program include defensible space and roadside treatments; evacuation support treatments; roadside turnout and signpost treatments; flammable exotic plant removal; hazard tree removal; and tree planting (i.e., replacing flammable vegetation with more fire-resistant vegetation). These ongoing activities have been addressed under CEQA in the UC Berkeley *2020 Long Range Development Plan EIR* (State Clearinghouse No. 2003082131). The areas within which each of these ongoing treatments are implemented are shown on Figure 4-1.

Ongoing defensible space treatments involve vegetation removal in areas within 100 feet of any structure, consistent with California State PRC 4291. Roadside treatments are implemented along major roads and trails within and bounding the Plan Area. Roadside treatments involve vegetation removal and are conducted along the strip of land up to 15 feet from the edge of pavement from both sides of designated roadways and trails for brush vegetation and tree removal or pruning. Evacuation support treatments involve removing highly flammable trees, understory shrubs and small trees that could enable torching, and trees that may block access/egress should they fall; these treatments are implemented within 100 feet on either side of evacuation routes. Roadside turnout and signpost treatments involve cutting grass and removing debris within a 50-foot radius of designated turnouts and around selected signposts. For exotic plant removal, UC Berkeley pulls or cuts eucalyptus, Monterey pine, and French broom seedlings, and applies herbicides to the cut exotic plants according to recommendations of a Pesticide Control Advisor (PCA). Hazard tree removal involves removing dead and hazardous trees or limbs that pose a public safety risk. Tree planting is conducted under the supervision of Facilities Services Fire Mitigation Program Manager. Native trees, including oaks, maples, and buckeyes are selected by staff, with volunteer labor planting the trees in the late winter or spring. This activity has occurred on Tightwad Hill, in openings created from the removal of hazard trees.

Typically, these vegetation treatment activities are carried out under contract by Facilities Services using hand crews and hand-held tools, with occasional use of machinery to cut grass and shrubs and to chip woody material. Herbicides are applied to roadside vegetation by hand-held tools; however, herbicide use is currently limited. Additional vegetation treatment activities are conducted by the Claremont Canyon Conservancy, UC Berkeley Forestry Club and a local non-profit, Take to The Hills, to assist in maintaining the Plan Area through removal of flammable exotic invasive species and planting less flammable species. The combined efforts of restoration work typically exceeds 500 volunteer-days annually.



Source: WVFMP (see Appendix A)

Figure 4-1 Ongoing Vegetation and Fire Fuel Management Treatments in the Hill Campus

Using a portion of the funding received by CAL FIRE California Climate Investments Fire Prevention Grant Program, Facilities Services anticipates that it will increase its implementation of defensible space and roadside treatments, roadside turnout and signpost treatments, flammable exotic plant removal, hazard tree removal, evacuation support treatments and selective tree planting throughout the Plan Area; these activities, which are included in the existing 2020 Hill Area Fire Fuel Management Program (2003), are part of the ongoing treatment and maintenance activities approved in the UC Berkeley *2020 Long Range Development Plan EIR* (State Clearinghouse No. 2003082131). Specific planned or recently completed projects are identified and described in Table 4-1.

Table 4-1 List of Projects in the Vicinity of the UC Berkeley Hill Campus

Project Name and Location	Description/Size	Status
Vegetation Management Projects		
Centennial Evacuation Support Treatment (Stadium Rim Way and Centennial Drive within the Hill Campus)	Trees were removed along and within 100 feet of Centennial Drive and Stadium Rim Way. The treatment comprised approximately 33 acres.	Completed in April 2020
Tightwad Hill Hazardous Tree Removal (Tightwad Hill within and adjacent to the Hill Campus)	Project will remove over 40 aging and/or dying Monterey pine trees in the area for safety.	Planned to occur during summer 2020
Tightwad Hill and Road Turnout Goat Grazing (Tightwad Hill and throughout the Hill Campus)	Goat grazing on Tightwad Hill and several turnouts in the Hill Campus using approximately 40 goats.	Planned to occur in 2020 and may occur annually
Annual Defensible Space and Roadside Treatments (throughout the Hill Campus)	Work includes vegetation removal within 15 feet of buildings, tree pruning within 100 feet of buildings, removal of vegetation within 100 feet of roadsides and turnouts. Refer to additional description in Section 4.3.1.	Planned to occur during summer 2020 and occur annually
Claremont Evacuation Support Treatment (Claremont Avenue within the Hill Campus)	Trees will be removed along and within 100 feet of Claremont Avenue over approximately 18 acres, using manual and mechanical treatments followed by the select use of herbicides to prevent re-sprouting of treated trees and shrubs.	Planned to occur during fall/winter 2020-2021
Jordan Evacuation Support Treatment Jordan Fire Trail (Jordan Fire Trail within the Hill Campus)	Trees will be removed along and within 100 feet of the Jordan Fire Trail over approximately 87 acres. Activities will primarily include use of a grapple saw to remove interior vegetation, followed by the select use of herbicides to prevent re-sprouting of treated trees and shrubs.	Planned to occur in 2021 or 2022
PG&E Utility Corridor Vegetation Clearance (transmission line corridor extending from the Grizzly Substation on Glaser Road in the Hill Campus past signpost 15 on Grizzly Peak Boulevard)	Work includes regular inspection of utility corridors and vegetation removal to meet state vegetation and fire safety standards, which require 4 feet clearances around power lines in high fire-threat. PG&E also removes hazardous vegetation such as dead or dying trees that pose a potential risk to the lines.	Ongoing
Non-Vegetation Management Projects		
Levine-Fricke Softball Field Improvement Project (Levine-Fricke Field in Strawberry Canyon)	Upgrade the existing Levine-Fricke field in Strawberry Canyon for the Women's Softball Program. The project would involve demolishing all existing facilities on site and constructing an upgraded softball field and two-story structure including a concourse.	Construction anticipated in 2020-2021
Centennial Drive Bridge Replacement Project (Centennial Drive near Lawrence Road)	The project would replace a structurally deficient bridge on Centennial Drive by creating a new bridge structure on a parallel alignment to the existing roadway. Upon completion of the project, Centennial Drive would cross the existing Lawrence Road over a new 250-foot-long viaduct structure.	In design stage; construction anticipated summer 2021
Hill Area Substation Platform Erosion Mitigation Project (LBNL property)	Erosion around the substation platform exposing the drilled pier supports requires drainage improvements and repairing shoring around the platform.	In design stage; construction anticipated late summer/early fall 2020

Project Name and Location	Description/Size	Status
Lawrence Hall of Science: All Gender Exterior Bathroom Project (1 Centennial Drive)	Develop gender neutral bathroom(s) and lactation room at Level A exterior area adjacent to "Forces of Nature" exhibit. New structure may be stand alone or, possibly connect to the existing building.	In planning phase; construction anticipated fall 2021 through early 2022
Lawrence Hall of Science: Exterior Water Intrusion Mitigation Project (1 Centennial Drive)	Remediate extensive water intrusion throughout the western and southern facade of structure, reseal or replace failed window assemblies, and refurbish or remediate failed patio waterproofing membrane.	Construction anticipated summer 2022
Lawrence Hall of Science: Outdoor Nature Learning Lab Project (1 Centennial Drive)	Renovate the C-Level (north) lawn into an experiential/observation science learning area; design may be split into two phases.	In design stage; phase 1 construction anticipated fall 2020
The Biological & Environmental Program Integration Center Project (LBNL property)	Construct a new 73,000 GSF, four-story laboratory research and office building to accommodate approximately 210 occupants.	In design stage; construction anticipated 2021-2023
Linear Asset Replacement Project (LBNL property)	Sitewide project to increase utility service reliability and develop utility corridors where common system alignment opportunities are practical. Utilities include natural gas, domestic water, electrical, communication/data, storm drain, and sanitary sewer infrastructure systems.	CEQA review pending; phase 1 construction anticipated 2022-2023; phase 2 construction anticipated 2025-2026; phase 3 construction anticipated 2027–2029
Building 79 Demolition and Grizzly Yard Expansion (LBNL property)	Historical site assessment, characterization, and demolition of a 4,593 GSF salvage processing facility, originally constructed in 1965. The project includes slab and soil removal.	Demolition activities anticipated in 2020; construction anticipated through 2021
Grizzly Substation Expansion (LBNL property)	Increase LBNL's main substation permanent capacity from 30 MVA to 70 MVA. Will include two new transformers.	Starting design in 2020; construction anticipated 2022–2024
Bayview Parcel 1 Clean-up Project (LBNL property)	Conduct site characterization and excavation, demolish and remove abandoned foundation elements and utility tunnels, and remediate subsurface soil contamination.	Activities anticipated 2020-2021
Old Town Demolition Project, Phases 5 – 7 (LBNL property)	Phase 5: characterize, abate and demolish buildings 4 and 14. Phase 6: remove building 4 and 14 slabs and address adjacent areas and soils. Phase 7: characterize, abate, and demolish buildings 7 and 7C	Phase 5: construction complete as of February 2020 Phase 6: construction anticipated in the next 2-3 years Phase 7: demolition activities anticipated 2020-2021
Transit Hub Sitework and Utilities Project (LBNL property)	Construct a new transit hub (i.e., main shuttle drop off station) to support the LBNL shuttle system and utility renewal-based modifications and improvements, including new electrical, sanitary sewer, water and storm drain.	CEQA review pending; construction anticipated 2021–2022
Seismic and Safety Modernization Building Project (LBNL property)	Demolish building 54 (a 16,000 GSF facility) and construct a new 46,000 GSF facility with a cafeteria, conference room, and space for relocating Health Services and Human Resources personnel. Also, includes a seismic retrofit of building 48.	CEQA review pending; construction anticipated 2021-2024
Bayview Site Utility Replacement Project (LBNL property)	Replace and upgrade utilities (e.g., electrical, sanitary) in the Bayview planning area of LBNL.	Construction anticipated 2020-2021
Building 73 Modernization Project (LBNL property)	Seismically upgrade building 73 (a 4,200 GSF facility) and renovate the entire building to accommodate occupancy for lab and office use. Includes demolition of existing interior of the building and demolition of a small nearby utility building (building 73A).	Construction anticipated 2020-2021

Notes: GSF = gross square feet; LBNL = Lawrence Berkeley National Laboratory; MVA = megavolt amperes (unit for measuring power); PG&E = Pacific Gas & Electric Company.

Source: Information provided by UC Berkeley in 2020 and adapted by Ascent.

4.3.2 Regional Vegetation and Fire Fuel Treatment Programs Implemented by Agencies Other than UC Berkeley

LAWRENCE BERKELEY NATIONAL LABORATORY WILDLAND FIRE MANAGEMENT PLAN

LBNL is responsible for managing vegetation on land within and outside its formal boundaries in the Hill Campus. The areas are defined in a 1996 Letter of Cooperation and extend management responsibility to areas surrounding the Strawberry Gate entrance to LBNL and slopes below Lawrence Drive. LBNL implements its Wildland Fire Management Plan throughout its property to reduce wildfire risk. Management activities include vegetative fuel reduction via disking and mowing as well as tree trimming, brush removal, and leaf litter removal (LBNL 2019).

CITY OF BERKELEY WILDFIRE EVACUATION PLAN

The City of Berkeley maintains a Wildfire Evacuation Plan that identifies evacuation zones and routes within the City. In case of a wildfire emergency, residents are instructed to evacuate via identified evacuation routes. The emergency access and evacuation network identified in the Wildfire Evacuation Plan includes all streets located within the fire hazard area. This includes Centennial Drive and Claremont Avenue (City of Berkeley 2020a). The City's General Plan requires that all evacuation routes be maintained to ensure safe and expedient passage by the Berkeley Fire Department (City of Berkeley 2020b).

CITY OF OAKLAND VEGETATION MANAGEMENT PLAN

The Oakland Vegetation Management Plan (VMP) provides a framework for managing fuel loads and high hazard vegetation management activities to reduce fired hazard on approximately 1,924 acres within the City of Oakland's designated High Fire Hazard Severity Zone (VHFHSZ). The Oakland VMP identifies vegetation management techniques implemented by the Oakland Fire Department (OFD) within the plan area. These include biological (grazing), hand labor (hand pulling and cutting), mechanical (mowing and masticating), chemical (herbicide), and prescribed fire. Garber Park and Claremont Avenue located south of the Hill Campus are identified as priority areas. Treatment activities conducted at Garber Park and along Claremont Avenue include vegetation removal to minimize ignition potential through the use of hand labor or mechanical techniques (City of Oakland 2019).

CITY OF OAKLAND STANDARDS FOR VEGETATION INSPECTIONS

The City of Oakland Vegetation Management Unit (VMU) conducts property inspections in areas within the city that are designated as Very VHFHSZ which include areas to the east and southeast of the Hill Campus. In collaboration with the OFD, VMU inspects homes and vacant parcels to identify and mitigate hazards that could contribute to the spread, growth, and intensity of wildfire. Inspections are done annually, and property owners are required to actively maintain their parcels in a fire-safe condition year-round. Property owners are required to maintain a 30-foot fuel reduction zone along the perimeter of the property. VMU requires that ground fuels, such as grass, small shrubs, and dead leaves or branches, should be cut or removed. In addition, tree crowns shall be 10-feet away from any structure and vegetation along fire roads shall be cleared (City of Oakland 2020).

ALAMEDA COUNTY COMMUNITY WILDFIRE PROTECTION PLAN

The Alameda County Community Wildfire Protection Plan (CWPP) provides a comprehensive analysis of wildfire hazards and risks, and identifies recommendations to aid in the reduction of wildfire risk in Alameda County wildland-urban interface (WUI) areas. Recommendations include educational programs, emergency preparedness, fuel reduction treatments, and treatment of structural ignitability. The Alameda County CWPP also provides a comprehensive list of fuel reduction projects throughout the county. These include ongoing weed abatement conducted by the Alameda County Fire Department (ACFD), Berkeley Fire Department, and LBNL. Ongoing fuel management, prescribed herbivory, and road maintenance is conducted by the East Bay Municipal Utility District, and implementation of the Wildfire Hazard Reduction and Resource Management Plan by East Bay Regional Park District and grant funded projects in Claremont Canyon by Oakland Fire Department and Oakland Fire Prevention District are ongoing (Alameda County CWPP 2015).

EAST BAY REGIONAL PARK DISTRICT WILDFIRE HAZARD REDUCTION AND RESOURCE MANAGEMENT PLAN

The East Bay Regional Park District (EBRPD) East Bay Hills Wildfire Hazard Reduction and Resource Management Plan (EBRPD plan) provides long-term strategies for reducing fuel loads and managing vegetation within the approximately 19,000-acre study area. The study area includes hill side parks located in close proximity to the Hill Campus, including Wildcat Canyon Regional Park, Tilden Regional Park, Claremont Canyon Regional Preserve, and Robert Sibley Volcanic Regional Preserve. The EBRPD plan includes wildfire hazard reduction and resource management goals to minimize the risk of Diablo wind-driven catastrophic wildfire along the WUI. To achieve these goals, the EBRPD plan outlines fuel treatment methods including mechanical and manual vegetation removal, herbicide application, prescribed burning, and prescribed herbivory (EBRPD 2009). Fuel reduction projects underway near the Plan Area for the WVFMP include the treatment of 15 acres of vegetation along Panoramic Way, bordering the southwest boundary of Strawberry Canyon, using mechanical methods and pile burning.

EAST BAY MUNICIPAL UTILITY DISTRICT EAST BAY WATERSHED FIRE MANAGEMENT PLAN

East Bay Municipal Utility District (EBMUD) East Bay Watershed Fire Management Plan (FMP) guides the implementation of fire protection and preparedness activities within an approximately 28,000-acre area. The FMP identifies specific fire management protocols for fire management units (FMU) within the area. FMUs are identified to the north and south of the Hill Campus. The FMP describes recent planning and management efforts to enable more proactive fire management practices, and outlines fuel modification treatments. Fuel modification treatments include mechanical and manual vegetation removal, horse logging (tree removal), herbicide application, roadside vegetation management, prescribed burning, and prescribed herbivory (EBMUD 2000). Proximate to the Plan Area for the WVFMP, EBMUD conducts ongoing maintenance of its fuel breaks along Grizzly Peak Boulevard between Centennial Drive and Fish Ranch Road.

4.3.3 General Plans

Population is projected to increase within Alameda and Contra Costa Counties through 2060 (DOF 2020) and beyond. Land use development needed to provide for housing, employment, and other needs of a growing population is primarily guided by general plans and specific plans adopted by city and county governments. The general plan is a comprehensive, long-term, and general document that describes plans for the physical development of a city or county.

Local governments are responsible for local land use decisions and planning, including permitting structures to be built in the State Responsibility Area (SRA) or Local Responsibility Area (LRA) and VHFHSZs. General Plan Safety Elements adopted by the cities of Berkeley and Oakland, as well as by Alameda and Contra Costa Counties, identify wildfire hazard areas and include policies to reduce the risk of wildfire in those areas (City of Berkeley 2001a; City of Oakland 2012; Alameda County 2014; Contra Costa County 2005a). Local governments are responsible for permitting structures to be built in the SRA or LRA VHFHSZs. Land use maps adopted by the cities of Berkeley and Oakland, and Alameda and Contra Costa Counties, show residential development within the FHSZs that are at risk from wildland fire (City of Berkeley 2001b; City of Oakland 2015; Alameda County 1994; Contra Costa County 2005b). Risk of wildfire is most acute in the WUI, where housing losses have increased significantly statewide over the past three decades (Stephens et al. 2009), including in the Bay Area, and this problem is expected to grow (Mann et al. 2014).

4.3.4 UC Berkeley Long Range Development Plan

Similar to a city or county's general plan, a Long Range Development Plan (LRDP) is UC Berkeley's general planning framework. The purpose of an LRDP is to provide adequate planning capacity for potential campus population growth. UC Berkeley is currently in the process of updating its 2020 LRDP through the 2036-37 academic year. This corresponds to a potential future population of 48,200 students and 19,000 faculty and staff. To support the future population, the LRDP Update proposes to add up to 11,700 student housing beds, 385 employee housing units, and approximately 4 million gross square feet (GSF) of academic and campus life space, comprising approximately 3 million GSF of academic, research, and support space and approximately 1 million GSF of campus life space (UC Berkeley 2020). The planning area for the LRDP Update encompasses the Hill Campus.

4.3.5 Plan Bay Area 2040

Plan Bay Area 2040 was adopted in 2017 to provide a roadmap for accommodating projected household and employment growth in the nine-county Bay Area by 2040 as well as a transportation investment strategy for the region. Plan Bay Area 2040 describes where and how the region can accommodate 820,000 new projected households and 1.3 million new jobs between now and 2040; details a regional transportation investment strategy given $303 billion in expected revenues from federal, state, regional and local sources over the next 24 years; and complies with Senate Bill 375, the state’s sustainable communities strategy law, which integrates land use and transportation planning and mandates both a reduction in greenhouse gas emissions from passenger vehicles and the provision of adequate housing for the region’s 24-year projected population growth. The Metropolitan Transportation Commission and the Association of Bay Area Governments have begun preparation of Plan Bay Area 2050.

4.3.6 Related Projects

Table 4-1 presents a list of projects considered in the cumulative scenario. Projects are identified within and adjacent to the Hill Campus, which is the geographic area sufficiently large to provide a reasonable basis for evaluating cumulative impacts. The projects listed in Table 4-1 are not intended to be an all-inclusive list of projects in the region, but rather include related projects in the vicinity of the Plan Area that could combine with environmental impacts of implementation of treatments under the WVFMP. UC Berkeley, LBNL, and PG&E are the entities that may implement projects in the Hill Campus.

4.4 CUMULATIVE IMPACT ANALYSIS

The following sections contain a discussion of the cumulative effects anticipated from implementation of the WVFMP, together with related past, present, and reasonably foreseeable probable future activities, projects, and plans within the identified geographic area of each of the environmental issue areas evaluated in Chapter 3 of this EIR. The analysis conforms with Section 15130(b) of the State CEQA Guidelines, which specifies that the “discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by the standards of practicality and reasonableness and should focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact.”

When considered in relation to other reasonably foreseeable projects, cumulative impacts to some resources would be significant and more severe than those caused by the proposed project alone.

For purposes of this EIR, the incremental effect of the project would be cumulatively considerable, and thus significant in and of itself, if the cumulative effect of related activities (past, current, and probable future activities), together with the effect of the proposed project, are significant, and the incremental contribution of the project to these effects is substantial enough to be considered cumulatively considerable.

Such an outcome can occur in one of two ways. First, the cumulative effect of related activities (past, current, and probable future activities) without the project is not significant, but the incremental effect of the project, when added to the cumulative effect of the related projects, is substantial enough to result in a new cumulatively significant impact. Or second, the cumulative effect of related activities (past, current, and probable future activities) is already significant and the addition of the effect of the project is substantial enough to make the project's contribution cumulatively considerable and thus significant in and of itself.

This cumulative analysis employs a multi-step approach: (i) assess whether the project, together with past, present, and probable future projects, will cause significant cumulative impacts, (ii) identify the project's contribution, without mitigation, to existing/anticipated (without the project) cumulative effects, (iii) determine whether, even with mitigation, the project's incremental contribution would be cumulatively considerable, (iv) if the answer is yes, to identify any additional potentially feasible mitigation that may be available, and (v) to identify the impact significance conclusion after implementation of all (project-specific and any additional) potentially feasible mitigation.

4.4.1 Aesthetics and Visual Resources

The geographic scope of the aesthetic and visual resource cumulative impact analysis is the Plan Area as well as surrounding areas with public views of the Plan Area and adjoining open space and park areas.

As discussed in Section 4.3, "Related Project and Plans," above, there are several similar past, present, and reasonably foreseeable projects that have affected and likely will affect vegetation, and thus aesthetics and visual resources, within and surrounding the Plan Area.

Examples of related projects and plans that could combine to result in significant cumulative impacts to aesthetics and visual resources are past land management practices that emphasize fire suppression, vegetation management and fuels treatment programs implemented within and outside of the Plan Area, (e.g., LBNL, City of Oakland, City of Berkeley, Alameda County, EBRPD, EBMUD), recreation and transportation projects, maintenance activities, and urban development as guided by city and county (i.e., City of Oakland, City of Berkeley, Alameda County, Contra Costa County) general plans and specific plans.

Some these projects, combined with implementation of the WVFMP, would result in a significant cumulative aesthetics and visual resources impact, because most types of fuel treatment and vegetation management projects create lasting visible changes on the landscape. Consequently, the cumulative visual impact of the treatment types would be significant to the extent they are visible from public viewpoints.

Vegetation treatments implemented under the WVFMP would create temporary visual impacts during implementation, but would create less-than-considerable contributions to cumulative impacts, in part because of their temporary nature and because of the implementation of EPMs. As described in Impact AES-1, under the WVFMP, varying degrees of temporary degradation of public views would result during active implementation of treatment activities such as manual and mechanical treatments and prescribed burning. However, because of the temporary and intermittent nature of treatment activities, and implementation of EPMs requiring staging of all treatment-related materials, including vehicles and equipment, outside of public viewsheds (EPM AES-1); and preparation of and adherence to a Burn Plan and Smoke Management Plan (SMP) (EPM AQ-1), which describes the conditions under which prescribed burning can occur to reduce the generation and visibility of smoke; short-term degradation would not be substantial and the WVFMP's contribution to short-term visual impacts from implementation of treatment activities **would not be cumulatively considerable**.

As described in Impact AES-2, all of the treatment types implemented under the WVFMP have the potential to result in long-term, substantial degradation of public views because they would create permanent visible changes on the landscape. Accordingly, the treatments implemented under the WVFMP would contribute considerably to cumulative visual impacts. As described in Impact AES-2, implementing Mitigation Measure AES-2 may reduce the visual impact as it requires UC Berkeley to conduct a visual reconnaissance of treatment areas to observe the surrounding landscape and determine if public viewing locations, including scenic vistas, public trails, and state scenic highways, have views of the proposed treatment area. If UC Berkeley identifies public viewing points, including heavily used scenic vistas, public trails, recreation areas, with lengthy views (i.e., longer than a few seconds) of a proposed treatment area, UC Berkeley will change the location of treatments to reduce their visibility from public viewpoints. If other locations do not exist that would reduce impacts to public viewers and achieve the intended wildfire risk reduction requirements of the treatment, UC Berkeley would thin and feather adjacent vegetation to break up the linear edges of treatment areas and strategically preserve vegetation at the edge of the treatment area to help screen public views and minimize the contrast between the treatment area and surrounding vegetation. If Mitigation Measure AES-2 would not adequately reduce the significant visual impact, the WVFMP's contribution to this impact **would be cumulatively considerable**.

As described in Impact AES-3, the Plan Area is largely undeveloped and few sources of light and glare are present. Because the Plan Area is largely undeveloped, exposure of the public to nighttime light or glare as a result of vegetation removal would be unlikely because it would require complete vegetation removal in locations where there are sensitive viewers and existing sources of substantial nighttime light or glare. Further, many treatment types would thin vegetation as opposed to completely remove it. Additionally, lights on the university campus must comply with Title 24 California Code of Regulations, Part 6 (California Energy Code, or the Energy Standards) for shielding and cutoffs that minimize light spillage and minimize atmospheric light pollution. Therefore, the WVFMP's contribution to light and glare impacts **would not be cumulatively considerable**.

4.4.2 Air Quality

The geographic scope for emissions of criteria air pollutants is the San Francisco Bay Area Air Basin (SFBAAB). Future levels of emissions from cumulative projects would be a function of the type and scale of the projects under construction and operation, including those described in Section 4.3, "Related Projects and Plans." Projected increases in population in California are anticipated to result in increased vehicle use, building operations, and associated emissions. Existing emissions in the SFBAAB have resulted in the designation of the SFBAAB as nonattainment with respect to the national ambient air quality standards (NAAQS) and California ambient air quality standards (CAAQS) for ozone and fine particulate matter with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$) and the CAAQS for respirable particulate matter with an aerodynamic diameter of 10 micrometers or less (PM_{10}). These statuses reflect an existing significant cumulative effect on air quality. Cumulative development and future population growth in the SFBAAB would continue to contribute $PM_{2.5}$ and PM_{10}, as well as and ozone precursors, reactive organic gases (ROG) and oxides of nitrogen (NO_X).

Implementation of the WVFMP would result in an increase in emissions of criteria air pollutants and precursors generated by treatment activities, including mechanical and manual treatments, managed herbivory, herbicide application, and prescribed burning. Emissions associated with these treatments would include exhaust generated by off-road equipment and machine-powered hand tools; exhaust from on-road vehicle trips associated with worker commutes and transport of equipment, as well as the hauling and processing of biomass; fugitive dust emissions generated by ground disturbance activities, including PM_{10} and $PM_{2.5}$; and smoke generated by the combustion of vegetation during prescribed burning, and air curtain burning.

The analysis of emissions of criteria air pollutants and precursors presented under Impact AQ-1 is inherently a cumulative impact analysis. As discussed under Impact AQ-1, the emissions generated by prescribed broadcast burns, pile burning, and incineration in an air curtain would not result in, or contribute to, nonattainment of the NAAQS or CAAQS for criteria air pollutants or conflict with air quality planning efforts in the region because these activities would comply with BAAQMD Regulation 5, which requires that they follow tailored Smoke Management Plans and only take place on permissive burn days. However, emissions of ozone precursors (i.e., ROG and NO_X) generated by mechanical and manual treatments under the WVFMP would exceed BAAQMD's recommended mass emission thresholds of 54 pounds per day (lb/day) and, therefore, result in, or contribute to, the nonattainment status with respect to the NAAQS and CAAQS for ozone in the SFBAAB and adverse health effects that could be experienced by exposed receptors. The criterion of 54 lb/day for ROG and NO_X is BAAQMD's recommended threshold of significance for evaluating a project's contribution to the nonattainment of the SFBAAB with respect to the NAAQS and CAAQS for ozone. Implementation of Mitigation Measure AQ-1 would reduce the contribution by the WVFMP to this impact, because it would require UC Berkeley to reduce the levels of ROG and NO_X emissions to less than 54 lb/day by limiting the number of treatment crews operating and/or requiring the use of electric powered chain saws instead of petroleum-fueled chain saws. Thus, after implementation of Mitigation Measure AQ-1, the WVFMP's contribution to significant cumulative impact to air quality **would not be cumulatively considerable**.

TACs are pollutants of localized concern. The emissions of multiple TACs by sources, including diesel particulate matter exhaust (diesel PM), is considered to be a cumulative impact to air quality in locations where receptors are exposed to high concentrations of TACs over the long term. As discussed under Impact AQ-2, TACs contained in smoke generated by prescribed burns could expose receptors to an acute, short-term health risk with a Hazard Index greater than 1.0; the WVFMP's contribution to short-term health risks from TAC exposure **would be cumulatively considerable**.

As discussed under Impact AQ-3, treatment activities implemented under the WVFMP would result in diesel PM emitted by diesel-powered on-road vehicles and off-road equipment, but the resulting levels of health risk exposure would not result in an incremental increase in cancer risk greater than 10 in 1 million or a Hazard Index greater than 1.0 at any receptors. Therefore, the WVFP's contribution to long-term health risks from TAC exposure **would not be cumulatively considerable**.

Impacts associated with odor exposure are not inherently cumulative. It is unlikely that odors generated by treatment activities would combine with odors generated by other cumulative projects. As discussed under Impact AQ-4, diesel PM generated by equipment used for treatment activities would not expose a substantial number of people to objectionable odors. Therefore, the WVFMP's contribution to odors from exposure to equipment exhaust **would not be cumulatively considerable**.

As discussed under Impact AQ-5, odors contained in smoke generated by prescribed burning could be considered objectionable and could expose a substantial number of people, thereby resulting in a cumulatively considerable contribution to odors. Feasible measures are not available to further prevent people from being exposed to odiferous smoke. Therefore, the WVFMP's contribution to odors from smoke emissions **would be cumulatively considerable**.

4.4.3 Archaeological, Historical, and Tribal Cultural Resources

The geographic scope for the analysis of cumulative impacts to historical resources, unique archaeological resources, tribal cultural resources, and human remains is the Plan Area and geographic affiliation of affected tribes.

Because all significant cultural resources are unique and nonrenewable members of finite classes, meaning there are a limited number of significant cultural resources, all adverse effects erode a dwindling resource base. The loss of any one archaeological site could affect the scientific value of others in a region because these resources are best understood in the context of the entirety of the cultural system of which they are a part. The cultural system is represented archaeologically by the total inventory of all sites and other cultural remains in the region. As a result, a meaningful approach to preserving and managing cultural resources must focus on the likely distribution of cultural resources, rather than on a single project or parcel boundary.

The historic lands of California tribal peoples have been affected by development since the arrival of Sir Francis Drake of England in 1579 and quickly grew with the establishment of 21 missions from San Diego to Sonoma between 1769 and 1821. Development of tribal lands continued with the discovery of gold, followed by California's admission to statehood in 1850, the agricultural boom in the late 1800s through the 1930s, and the post-World War II population growth. Similarly, historical resources throughout California have been affected by suburban sprawl, downtown redevelopment projects, and transportation projects. These activities have resulted in an existing significant adverse cumulative effect on historical resources, unique archaeological resources, tribal cultural resources, and human remains. Cumulative development and related vegetation treatment projects and programs described in Section 4.3, "Related Projects and Plans" will continue in the foreseeable future to contribute to the disturbance of cultural resources.

The WVFMP, in combination with other related projects and plans throughout the Plan and surrounding areas, could contribute to ongoing substantial adverse changes in the significance of unique archaeological resources and subsurface historical resources. In regard to inadvertent discovery of an unknown unique archaeological or subsurface historical resource, implementation of Mitigation Measures CUL-1a through CUL-1c would help to identify, avoid, and protect unique archaeological and subsurface historical resources to reduce the WVFMP's contribution to potential impacts on these resources. With implementation of these measures, adverse effects on currently known archaeological resources and subsurface historical resources and potentially newly discovered cultural resources would be avoided or mitigated. Therefore, the WVFMP's contribution to impacts to unique archaeological resources and subsurface historical resources from implementation of treatment activities **would not be cumulatively considerable**.

The WVFMP, in combination with other related projects and plans throughout the Plan and surrounding areas, could contribute to ongoing substantial adverse changes in the significance of tribal cultural resources, if determined to be present in the Plan Area. In regard to impacts to tribal cultural resources, implementation of Mitigation Measure CUL-2 would further reduce impacts to tribal cultural resources because it would require completion of tribal consultation and identification of measures to protect any identified resource to avoid a substantial adverse change to its significance. UC Berkeley anticipates that through completion of the tribal consultation process, all impacts to tribal cultural resources would be reduced to a less-than-significant level. However, given that tribal consultation is ongoing, it cannot be known at this time whether measures developed during consultation would adequately avoid a substantial adverse change in the significance of a tribal cultural resource. Therefore, the WVFMP's contribution to a cumulative impact related to tribal cultural resources **would be cumulatively considerable**, and this impact would be significant and unavoidable. UC Berkeley has incorporated all feasible measures as identified above, including completing consultation.

Compliance with California Health and Safety Code Sections 7050.5 and 7052 and PRC Section 5097 would require that treatment and disposition of human remains occurs in a manner consistent with state guidelines and California Native American Heritage Commission guidance and impacts would be avoided or minimized. Disturbance of human remains would constitute a significant cumulative impact. All projects are required to comply with the aforementioned regulations, including treatments implemented under the WVFMP. Therefore, the WVFMP's contribution to a significant cumulative impact related to human remains **would not be cumulatively considerable**.

4.4.4 Biological Resources

The geographic scope for analysis of cumulative impacts to biological resources is the Plan Area, the range of affected special-status species and sensitive habitats, as well as adjacent migration and movement corridors (e.g., open space areas surrounding the Plan Area, the Pacific flyway for migratory birds) that are connected to the Plan Area.

As discussed above in Section 4.3, "Related Project and Plans," several similar past, present, and reasonably foreseeable projects have and likely will result in impacts on special-status plants, special-status wildlife, sensitive natural communities, riparian habitat, state or federally protected wetlands, wildlife movement corridors, and native wildlife nurseries. These projects include past fire suppression activities that have been widespread, other vegetation management efforts (e.g., LBNL, City of Oakland, City of Berkeley, Alameda County, EBRPD, EBMUD) and urban development as guided by city and county (i.e., City of Oakland, City of Berkeley, Alameda County, Contra Costa County) general plans and specific plans. Most of these projects would be discretionary and subject to environmental review under CEQA or otherwise subject to regulations protective of biological resources (e.g., ESA, and California Fish and Game Code), and would implement measures to reduce or compensate for adverse effects on sensitive natural resources. The existing cumulative impacts of these projects, activities, and disruptions to ecosystem and biophysical processes (e.g., climate change, invasive species invasions) on special-status species, sensitive natural communities, riparian habitat, state and federally protected wetlands, and wildlife movement corridors and nursery sites are considered significant.

As analyzed and described in Section 3.5, "Biological Resources," implementation of treatment activities under the WVFMP would result in several direct and indirect impacts related to the disturbance or loss of special-status plants, special-status wildlife and wildlife habitat, riparian habitat, sensitive natural communities, state or federally protected wetlands, wildlife movement corridors, and wildlife nurseries. EPMs will be implemented as part of the WVFMP to avoid or minimize potential adverse effects, many of which were developed specifically to protect biological resources. Implementation of these EPMs would reduce the likelihood and magnitude of many potential adverse effects on biological resources; however, impacts would not be avoided entirely. Some residual impacts on biological resources after implementation of EPMs, in combination with other past, present, and reasonably foreseeable projects that have resulted or would result in similar impacts would contribute to the significant cumulative effects on these biological resources if left unmitigated.

The following discusses residual cumulative impacts for each biological resource addressed in this EIR in consideration of the relevant mitigation measures included in Section 3.5, “Biological Resources,” which would be implemented in addition to the EPMs.

Special-Status Plants

Treatment activities under the WVFMP would result in ground disturbance, vegetation removal, and modification of habitat, which could result in direct and indirect loss of special-status plants or modification of their habitat. Even with implementation of the EPMs described previously, this would contribute to significant cumulative impacts. However, implementation of Mitigation Measures BIO-1a and BIO-1b, would reduce the proposed WVFPM’s contribution to this impact, because they would require UC Berkeley to identify and avoid special-status plant occurrences to the extent feasible and provide compensation if avoidance is not feasible. With implementation of these EPMs and mitigation measures, implementation of the WVFMP is not expected to substantially reduce the abundance or viability of special-status plant populations. Therefore, the WVFMP’s contribution to significant cumulative impacts on special-status plants **would not be cumulatively considerable**.

Special-Status Wildlife

Treatment activities under the WVFMP would result in ground disturbance; vegetation removal; modification of habitat; and the use of heavy machinery, vehicles, and large crews, which could result in the disturbance or direct loss of special-status wildlife. Modification of wildlife habitat function could also occur as a result of treatment activities, especially prescribed burning and mechanical treatment activities. Several special-status wildlife species have been adversely affected as a result of historic and ongoing habitat loss across their range, which in some cases has been a contributing factor in their listing under ESA or CESA. Other special-status wildlife species have extremely limited ranges or narrow habitat requirements; thus, loss of habitat function within the range of these species could result in the narrowing of exclusion of the species from its range. This would contribute to significant cumulative impacts. Mitigation Measures BIO-1a, BIO-2a, BIO-2b, BIO-2c, BIO-2d, BIO-2e, BIO-2f, BIO-2g, BIO-2h, BIO-2i, BIO-2j, BIO-2k, BIO-5a, HAZ-5, and HYD-1 would reduce these direct and indirect impacts to less-than-significant levels for special-status wildlife because protective actions including implementation of no-disturbance buffers, avoidance of sensitive period of the species’ life history, and compensation for unavoidable loss of special-status wildlife species or habitat function would reduce the potential impacts of injury, mortality, or other disturbance on individual animals and habitat. These mitigation measures would substantially reduce the WVFMP’s contribution to cumulative impacts on special-status wildlife and wildlife habitat such that any contribution **would not be cumulatively considerable**.

Sensitive Natural Communities and Riparian Habitat

Treatment activities under the WVFMP could adversely affect sensitive natural communities and riparian habitat if these habitats are present within the treatment areas and are subject to treatment activities such as prescribed burning, vegetation removal, or ground disturbance. These activities could result in loss or degradation of these sensitive habitats, which would contribute to significant cumulative impacts. Implementation of Mitigation Measures BIO-1a, BIO-3a, BIO-3b, BIO-3c, HAZ-5, and HYD-1 would reduce the WVFMP’s contribution to this significant cumulative impact on sensitive natural communities and riparian habitat because they would require project proponents to minimize vegetation removal within sensitive natural communities to the degree feasible and compensate for unavoidable losses of sensitive natural communities and riparian habitat. Thus, with implementation of these mitigation measures, the contribution of the WVFMP to significant cumulative impacts on these habitats **would not be cumulatively considerable**.

State and Federally Protected Wetlands

Implementation of the WVFMP could adversely affect state or federally protected wetlands if treatment activities (e.g., vegetation removal, ground disturbance, use of heavy machinery) occur within or adjacent to these habitats, particularly if these features have not been previously identified. This would contribute to significant cumulative impacts. Implementation of Mitigation Measures BIO-1a, BIO-4a, HAZ-5, HYD-1, would substantially reduce the WVFMP's potential contribution to this significant cumulative impact because it would require delineation of the boundaries of state and federally protected wetlands; and implementation of a buffer around the wetland where activities are restricted so that no inadvertent damage or destruction to wetland habitats would occur during treatment activities; and that prescribed burns are designed to avoid loss of wetland functions. Thus, after implementation of these EPMs and mitigation measures, the WVFMP's contribution to significant cumulative impacts on state and federally protected wetlands **would not be cumulatively considerable**.

Wildlife Movement Corridors and Nursery Sites

Treatment activities under the WVFMP could directly and indirectly adversely affect wildlife movement corridors and nursery sites if treatment activities occur within or adjacent to these areas. This would contribute to significant cumulative impacts. Implementation of relevant EPMs reduces the WVFMP's contribution to this cumulative impact on wildlife movement corridors and wildlife nursery sites because they require actions to prevent degradation of sensitive habitats. However, impacts could still occur. In addition to implementation of EPMs, implementation of Mitigation Measures BIO-1a, BIO-2g, BIO-3a, BIO-3b, BIO-3c, BIO-5a, BIO-5b, HAZ-5, and HYD-1 would reduce the WVFMP's contribution to the significant cumulative impact on wildlife movement corridors and wildlife nursery sites because it would require identification, avoidance, or compensation for sensitive habitats (e.g., sensitive natural communities, riparian habitat), installation of wildlife-friendly fencing for managed herbivory activities to avoid entanglement during wildlife movement, retention of nursery sites identified by implementation of Mitigation Measure BIO-1a, and establishment of no-disturbance buffers around these sites to prevent disturbance. Thus, after implementation of relevant EPMs and these mitigation measures, the WVFMP's contribution to significant cumulative impacts on wildlife movement corridors and nursery sites **would not be cumulatively considerable**.

Conflict with Local Policies and Ordinances

As a constitutionally-created state entity, the University of California, which includes UC Berkeley, is not subject to local governments' regulations, including city and county general plans and zoning ordinances. Nonetheless, it is university policy to evaluate proposed projects for consistency with local plans and policies. Therefore, the discussion that follows is for informational purposes, not for determination of significance.

There are several policies in the City of Berkeley, City of Oakland, Alameda County, and Contra Costa County general plans that protect biological resources, such as native plants; rare, threatened, and endangered fish, wildlife, and plants; wildlife habitat; woodland; native oak, California bay, and California buckeye trees; open space; wetlands; riparian habitat; creeks; watersheds; and wildlife migratory corridors. As described above, implementation of the WVFMP could adversely affect biological resources that may also be protected by local policies, such as special-status species, riparian habitat, wetlands, and wildlife movement corridors. Adverse effects to any of these biological resources would contribute to significant cumulative impacts. Implementation of relevant EPMs and Mitigation Measures BIO-1a, BIO-2a, BIO-2b, BIO-2c, BIO-2d, BIO-2e, BIO-2f, BIO-2g, BIO-2h, BIO-2i, BIO-2j, BIO-2k, BIO, BIO-3a, BIO-3b, BIO-3c, BIO-4a, BIO-5a, BIO-5b, HAZ-5, and HYD-1 would reduce the WVFMP's contribution to significant cumulative impacts to special-status species, riparian habitat, wetlands, and wildlife movement corridors for the reasons described above for each type of resource. Thus, after implementation of relevant EPMs and mitigation measures, the WVFMP's contribution to significant cumulative impacts from conflicts with local policies protecting biological resources **would not be cumulatively considerable**.

4.4.5 Geology and Soils

The geographic scope for the analysis of cumulative impacts to geology and soils is all areas where vegetation could be treated within the same watershed, the Corte Madera Creek-Frontal San Francisco Bay Estuaries Watershed. Implementation of treatments under the WVFMP has the potential to result in soil erosion and slope instability. Other vegetation treatment programs and projects implemented by UC Berkeley or others listed in Section 4.3, "Related Projects and Plans" also have the potential to result in erosion and slope instability. However, implementation of EPMs would avoid and minimize substantial erosion or risk of landslide for treatments implemented under the WVFMP. Other vegetation treatment programs within the watershed would implement similar measures (e.g. City of Oakland Vegetation Management Plan, East Bay Regional Park District Wildfire Hazard Reduction and Resource Management Plan, East Bay Municipal Utility District Watershed Fire Management Plan). Furthermore, cumulative impacts associated with erosion and landslide related to wildfire are more severe in areas not managed with vegetation treatment programs. Therefore, the WVFMP, together with past, present, and probable future projects, would not cause significant cumulative impacts.

As described in Section 3.6, "Geology and Soils," the WVFMP would avoid significant adverse effects to geology and soil resources through the incorporation of EPMs that protect against erosion and landslide by: wetting unpaved, dirt roads (EPM AQ-2); minimizing ground disturbance (EPM BIO-6); limiting mechanical equipment during and after precipitation (EPM GEO-1); stabilize disturbed soil areas (EPM GEO-2); minimizing erosion (EPM GEO-3); draining stormwater via water breaks (EPM GEO-4); evaluating steep slope areas (EPM GEO-5); and implementing water quality protections (EPM HYD-1). With implementation of relevant EPMs, the WVFMP's contribution to cumulative geology and soil impacts in the Corte Madera Creek-Frontal San Francisco Bay Estuaries watershed **would not be cumulatively considerable**.

4.4.6 Greenhouse Gas Emissions and Climate Change

The quantity of GHGs in the atmosphere that ultimately result in climate change is enormous and, as described in Section 3.7, "Greenhouse Gas Emissions and Climate Change," under "Physical Scientific Basis of Greenhouse Gas and Climate Change," has resulted in climate change, which is a cumulatively significant impact. Because climate change is a global phenomenon, the cumulative context of this impact is all past, present, and reasonably foreseeable projects in the world, including GHG emission sources and carbon sinks. No single project alone would measurably contribute to an incremental change in the global average temperature, or to global, local, or microclimates and, from the standpoint of CEQA, GHG impacts relative to global climate change are inherently cumulative. The analysis under Impact GHG-1 and Impact GHG-2 in Section 3.7 therefore reflects cumulative significance determinations that are cross-referenced herein. As described under those impacts, implementation of the WVFMP would be consistent with plans that address the carbon balance in natural and working lands that are part of state-wide mandates to achieve GHG reductions and would therefore be less than significant and **would not be cumulatively considerable.**

4.4.7 Hazards and Hazardous Materials

Impacts relating to hazards and hazardous materials are highly localized and typically contained within a given project area. The geographic scope for hazards and hazardous materials cumulative impacts is the Plan Area and an approximately 0.10-mile wide buffer surrounding it, because there is low risk for any activities outside the Plan Area to combine with hazards or hazardous materials within the Plan Area and create a more substantial, cumulative impact. Therefore, the cumulative hazards and hazardous materials analysis considers the list of projects in the Plan Area (Table 4-1) as well as UC Berkeley's ongoing vegetation and fire fuel management activities in the Plan Area (Section 4.3.1).

Potential to Create a Significant Health Hazard from the Use of Hazardous Materials

Past, present, and reasonably foreseeable projects combined with the WVFMP activities would not result in a significant cumulative health hazard or cumulative hazard to the environment from the use of hazardous materials because other projects, such as other vegetation treatment activities, urban development directed by local agencies, and others would also have to comply with all of the state and federal laws regulating the transport, storage, use, and disposal and hazardous materials.

As described in Impact HAZ-1, treatment activities proposed under the WVFMP would require the use of various types of equipment and vehicles, which need fuels, oils, and lubricants to operate. In addition, fuels would also be used to implement prescribed burns. The use, transport, storage, and disposal of common hazardous materials under the WVFMP could result in an accidental upset or health hazard if released into the environment. EPMs HAZ-1 and HYD-1 would be implemented which require that all equipment be maintained per manufacturer's specifications; be inspected for leaks before the start of treatment activities; and fuels, heavy equipment, and other potentially hazardous materials to be kept at a sufficient distance from watercourses to prevent accidental leaks or spills from entering the watercourse. These EPMs would minimize leaks and the risk of resultant contamination from entering the environment. Furthermore, several federal and state laws regulate the use, transport, storage, and disposal of hazardous materials, including the California Hazardous Waste Control Act (HWCA), California Department of Toxic Substances Control (DTSC's) Unified Program, and Occupational Safety and Health Administration (OSHA) and U.S. Environmental Protection Agency (EPA) regulations, with which UC Berkeley would be required to comply. Although implementation of the WVFMP would increase the number and extent of treatment activities occurring within the Plan Area and thus increase the use of common hazardous materials in the Plan Area, with implementation of EPMs and adherence to relevant regulations, no significant hazards would be created from the use of hazardous materials under the WVFMP at both the program- and project-level. Therefore, the WVFMP's contribution to hazards **would not be cumulatively considerable**.

Potential to Create a Significant Health Hazard from the Use of Herbicides

Past, present, and reasonably foreseeable projects combined with the WVFMP activities would not result in a significant cumulative health hazard or cumulative impact to the environment from the use of herbicides because of the strict registration process of pesticides in California by the California Department of Pesticide Regulation (DPR) and numerous regulations controlling the storage, use, and disposal of pesticides (e.g., by EPA, DTSC, DPR and others).

As described in Impact HAZ-2, herbicide application under the WVFMP would require increased transportation, use, storage, and disposal of various herbicides, which could result in risks related to human exposure by herbicide handlers or when applied in areas in close proximity to the public. Under normal conditions, compliance with all laws, regulations, and herbicide label instructions, along with proper personal protection equipment, would prevent significant risks related to human exposure to herbicides. However, potentially adverse effects could occur if a large spill were to occur or should herbicides drift from target areas in close proximity to the public (e.g., fire trails within the Plan Area or residences adjacent to the Plan Area). Several EPMs have been incorporated into the Plan to minimize the potential for significant health risks (EPM HAZ-1 through HAZ-6). These EPMs require all equipment used for herbicide application to be inspected each day for leaks and prompt removal of any equipment found leaking (EPM HAZ-1); UC Berkeley or the licensed Pesticide Control Advisor to prepare a Spill Prevention and Response Plan before beginning herbicide treatment activities (EPM HAZ-2); compliance with all herbicide application regulations to protect the safety of workers and the public during the transport, mixing, use, storage, and disposal of herbicides (EPM HAZ-3); triple rinsing of herbicide and adjuvant containers with clean water at an approved site and dispose of rinsate per 3 CCR Section 6684 and dispose of all herbicides following label requirements and waste disposal regulations (EPM HAZ-4); employing techniques during herbicide application to minimize drift (EPM HAZ-5); and providing informational signage at each pedestrian entry point before and at least 24 hours after herbicide application (EPM HAZ-6). Therefore, with the incorporation of EPMs to protect public health and safety from herbicide use, the WVFMP's contribution to cumulative impacts related to herbicide use **would not be cumulatively considerable**.

4.4.8 Hydrology and Water Quality

The geographic scope for hazards and hazardous materials is considered in the context of the local San Francisco Bay watershed as described in Section 3.9, Hydrology and Water Quality. Water Quality in the San Francisco Bay has been degraded by a variety of historical and ongoing industrial, urban, and agricultural activities and their associated discharges to surface and groundwaters both from the San Francisco region and runoff from the Sacramento and San Joaquin river basins. In the local subwatersheds, high levels of pesticides and sediment carried to urban creeks through stormwater runoff have created toxicity issues for aquatic organisms. Currently there are fourteen active

TMDL programs in the San Francisco Bay estuary system working to address this existing adverse cumulative condition for hydrology and water quality in the San Francisco Bay.

The cumulative projects described above in Section 4.3, "Related Projects and Plans" include vegetation management and wildfire hazard reduction projects throughout the region and at UC Berkeley. These projects include many of the same activities as those included in the WVFMP such as prescribed herbivory, manual and mechanical vegetation removal, and herbicide use. These management activities could cause ground disturbance leading to increased erosion and sediment delivery to adjacent waterbodies. Additionally, pollutants, such as animal wastes, herbicides residues, and fuels and lubricants, could be spilled or carried by runoff into watercourses. As described in Section 3.9, "Hydrology and Water Quality," the WVFMP would avoid significant adverse effects to water quality and hydrology through the incorporation of EPMs, which protect water quality by: minimizing erosion and prohibiting the use of heavy equipment on steep slopes (EPMs BIO-6, GEO-1, GEO-2, and GEO-3); using only aquatic herbicide formulations near waters and wet areas (EPM HYD-2); excluding managed herbivory near watercourses (EPM HYD-1); implementing protocols to prevent leaks, spills, and misapplication of herbicides and chemicals (EPM HAZ-1 through HAZ-5); and requiring careful planning of prescribed fire to avoid severe burns. Additionally, Mitigation Measure HYD 1 would maintain protective buffers around watercourses to capture pollutants carried in runoff. The existing adverse water quality condition in the San Francisco Bay watershed constitutes a significant cumulative effect; however, because the WVFMP would include these protective measures, implementation of treatments under the Plan would not substantially degrade surface or groundwater quality or conflict with the applicable water quality control plan, and the WVFMP's contribution to this significant cumulative impact **would not be cumulatively considerable**.

4.4.9 Noise

The geographic scope of the cumulative impact analysis for noise encompasses the Plan Area. The existing noise environment within the Plan Area consists primarily of vehicular traffic on the roadway network, sounds generated by people along fire trails, and natural sounds such as birds, wind, and tree movement away from roadways and trails. As discussed under Impact NOI-1, noise generated by manual, mechanical, and prescribed broadcast burning treatment activities as well as chipping/mastication and pile burning that would be implemented under the Plan would infrequently and temporarily expose nearby residential land uses to elevated noise levels that could exceed local noise standards. Implementation of Mitigation Measure NOI-1 would require UC Berkeley to notify nearby residents, LBNL and UC Berkeley staff and students of treatment activities, which would allow those notified to adequately prepare for any noise increases generated during treatment implementation. However, it would not decrease noise levels at noise-sensitive residences below applicable noise standards. Implementation of Mitigation Measure AQ-1 would decrease noise levels at nearby noise-sensitive receptors when electric-powered chainsaws are used. However, electric-powered chainsaws would not completely replace gas-powered chainsaws during Plan implementation; therefore, gas-powered chainsaws, along with the other equipment that could exceed local noise standards (e.g., mechanical equipment and water tenders), would be used close to the Plan Area boundary near residences. It is not anticipated that noise generated by other projects conducted in the Plan Area, such as those listed in Table 4-1, would simultaneously impact the same residences as noise generated by vegetation treatments because noise would be localized to those residential areas close to the noise-generating treatment activity. However, because noise levels at residences could exceed applicable local noise standards from Plan implementation, this cumulative impact would be significant and the contribution to this impact by treatment activities implemented under the Plan **would be cumulatively considerable**.

4.4.10 Recreation

The geographic scope of the cumulative impact analysis for recreation encompasses the Plan Area as well as public recreational areas in the vicinity of the Plan Area. The population of Alameda County and the student population of UC Berkeley is projected to increase during the period in which the WVFMP would be implemented. Planned population growth, and local regulation of associated development within the jurisdictional boundaries of incorporated cities and unincorporated areas prevent the occurrence of an existing cumulative recreation impact by implementing adopted General Plans that include a policy framework which guides development, designates appropriate areas for development, and guides the preservation of public open space consistent with Government Code Section 65560.

Implementation of the WVFMP would include implementation of vegetation treatments within the Plan Area and would not involve the development of residential communities or similar types of development or induce substantial population growth in an area that would require the construction of or expansion of recreational facilities. However, depending on the location of the treatment within the Plan Area, proposed treatment activities may temporarily restrict public access to surrounding areas including trails and roads for safety reasons or cause nuisance impacts related to dust, aesthetics, and noise; this would disrupt the recreation experience. If other cumulative projects within the Plan Area, such as those listed in Table 4-1, would occur concurrently with proposed treatment activities and result in temporary restrictions or nuisance impacts on recreation, these could combine with the effects of the WVFMP and result in a significant cumulative impact on recreation. As discussed in Impact REC-1, implementation of EPMs would minimize disruptions to recreational users by storing equipment outside of viewshed of fire trails and roadways, whenever possible (EPM AES-1), minimizing smoke dispersion (EPM AQ-1), minimizing visible dust (EPM AQ-2), notifying the public of temporary closures of roads or recreation areas (EPM AD-2), and minimizing the noise during treatments (EPMs NOI-2 through NOI-4). Therefore, the WVFMP's contribution to impacts on recreational resources **would not be cumulatively considerable.**

4.4.11 Wildfire

The geographic scope for the wildfire cumulative impact analysis is the Plan Area and the Plan Area vicinity including the East Bay Hills because wildfire in the Plan Area can spread to adjacent lands and vice versa. Therefore, the cumulative wildfire analysis considers the list of projects in the Plan Area (Table 4-1) as well as UC Berkeley's ongoing vegetation and fire fuel management activities in the Plan Area (Section 4.3.1). Of these, there are several similar past, present, and reasonably foreseeable projects that have and likely will use internal combustion engines within wildlands, which have the potential to create sparks and subsequent fire, and employ prescribed burning within and surrounding the Plan Area. Examples of related projects and plans that could combine to result in significant cumulative impacts are implementation of ongoing vegetation and fire fuel management by Facilities Services in the Hill Campus, the Lawrence Berkeley National Laboratory Federal Wildland Fire Management Plan, hazard vegetation management activities conducted by the City of Oakland, and implementation of the East Bay Regional Park District Wildfire Hazard Reduction and Resource Management Plan.

The other past, present, and reasonably foreseeable projects identified in Section 4.3, "Related Projects and Plans," combined with the WVFMP activities could result in a significant cumulative impact related to exposing people or structures to uncontrolled spread of fire or exacerbating wildfire risk as both the frequency and severity of wildfires in the area are increasing (see Section 3.12, "Wildfire," for a description of current wildfire trends).

As described in Impact WIL-1, WVFMP treatment activities and maintenance treatments could result in temporary risks associated with fire from prescribed burning, as well as from the use of vehicles and heavy machinery in the Plan Area as each can increase the risk of an accidental wildfire ignition. Several EPMs would be implemented to reduce the risk of fire including not conducting vegetation treatments during extreme fire danger conditions such as red flag warnings, and conducting inspections for fire following felling, yarding, and mechanical loading activities occurring during the dry season (EPM WIL-1); machine-powered hand tools would have federal- or state-approved spark arrestors (EPM WIL-2); and tree cutting crews would carry one fire extinguisher per chainsaw and one long-handle shovel and one axe or Pulaski, and a fire suppression resources inventory would be submitted to the local CAL FIRE unit before prescribed burning (EPM WIL-3), which would help to minimize the risk of accidental wildfire ignition. Smoking is also prohibited within the Plan Area. Therefore, it is unlikely that the presence and use of vehicles and equipment needed to implement the treatment activities would substantially exacerbate fire risk resulting in exposing people and structures to uncontrolled spread of wildfire. In addition, given all of the preparation (e.g., of a SMP and Burn Plan), ongoing monitoring and maintenance, and safety protocols, prescribed burning would not substantially exacerbate fire risk or expose people and structures to uncontrolled spread of wildfire. In the long term, as one of the primary purposes of the WVFMP, implementation of the treatment activities and maintenance activities would reduce wildfire risk. Therefore, to the extent the treatments reduce wildfire risk, implementation of the WVFMP would have a beneficial effect related to wildfire over the long term and would not exacerbate fire risk. Overall, the WVFMP, in combination with other vegetation treatment plans and projects identified in Section 4.3, “Related Projects and Plans,” would combine to reduce the risk of uncontrolled wildfire throughout the Plan Area and surrounding area. Therefore, the WVFMP’s contribution to exposing people and structures to uncontrolled spread of wildfire and exacerbating fire risk from implementation of treatment activities **would not be cumulatively considerable**.

The other past, present, and reasonably foreseeable projects identified in Section 4.3, “Related Projects and Plans,” combined with the WVFMP activities could result in a significant cumulative impact related to post-fire flooding or landslides. As described under Impact WIL-2, the WVFMP does not include new housing nor would it result in substantial unplanned population growth. Therefore, it would not expose people or structures to substantial risks related to post-fire flooding or landslides. Although prescribed broadcast burning is proposed under the WVFMP, it would be low severity and retain significant vegetation, thereby maintaining the stability of burned areas. Pile burning under the WVFMP would be used as a biomass disposal method; however, pile burning would be infrequent and used to dispose of up to 5 percent of the biomass created. In addition, it would be used to burn piles of previously cut vegetation and would not substantially affect root systems of existing vegetation or otherwise destabilize areas. In addition, EPMs would be incorporated into qualifying projects and maintenance treatments under the WVFMP to stabilize disturbed soils and minimize erosion (EPM GEO-2), drain stormwater via water breaks to reduce stormwater runoff (EPM GEO-4), and require that a registered professional forester or licensed geologist evaluate treatment areas for potential issues with instability and modify treatments to account for instability issues (EPM GEO-5). Therefore, prescribed burning under the WVFMP, including maintenance treatments, would not expose people or structures to substantial risks from post-prescribed burning landslides or flooding, and the WVFMP’s contribution to impacts related to post-fire flooding or landslides from implementation of treatment activities **would not be cumulatively considerable**.

5 OTHER CEQA CONSIDERATIONS

Section 15126 of the State CEQA Guidelines requires that all aspects of a project be considered when evaluating its impact on the environment, including planning, acquisition, development, and operation. As part of this analysis, the EIR must also identify the following: 1) significant environmental impacts that cannot be avoided if the project is implemented, 2) significant irreversible environmental changes that would result from implementation of the project, and 3) growth-inducing impacts of the project. Although growth inducement itself is not considered an environmental effect, it could potentially lead to foreseeable physical environmental effects, which are discussed under "Growth-Inducing Effects" below.

5.1 SIGNIFICANT AND UNAVOIDABLE IMPACTS OF THE WVFMP

Public Resources Code (PRC) Section 21100(b)(2)(A) directs that an EIR shall include a detailed statement setting forth "in a separate section: any significant effect on the environment that cannot be avoided if the project is implemented." Accordingly, this section provides a summary of significant environmental impacts of the WVFMP that cannot be mitigated to a less-than-significant level.

Section 2.6 of Chapter 2, "Project Description," presents the EPMs for the WVFMP. The EPMs will be incorporated by UC Berkeley into vegetation treatments implemented under the WVFMP as a standard part of treatment design and implementation. EPMs would be implemented for all treatments to the extent they are applicable, analogous to standard operating procedures or best management practices. EPMs are intended to avoid and minimize environmental impacts and, in some cases, promote compliance with applicable laws and regulations. For some environmental resources in specific locations or circumstances, there may be residual impacts that cannot be adequately avoided or minimized with implementation of EPMs. Chapter 3, "Environmental Setting, Impacts, and Mitigation Measures," provides a description of the potential environmental impacts of the WVFMP, implementation of applicable EPMs, and includes various mitigation measures to reduce residual impacts, to the extent feasible. Both EPMs and mitigation measures will be included in the WVFMP Mitigation Monitoring and Reporting Program to assist in implementation of all environmental protection features of later activities consistent with the WVFMP.

Chapter 4, "Cumulative Effects Analysis," determines whether the incremental effects of the WVFMP are significant when viewed in connection with the effects of past, present, and probable future projects and programs. After implementation of EPMs and mitigation measures, most of the impacts associated with the WVFMP would be reduced to a less-than-significant level.

The following impacts are considered significant and unavoidable; that is, no feasible mitigation is available or the mitigation measures available would not reduce the impact to a less-than-significant level. Note, this is only a summary of potentially significant and unavoidable impacts; Chapters 3 and 4 of this EIR provide a complete analysis and explanation of the impact significance determinations.

Implementation of the WVFMP would result in the following significant unavoidable environmental impacts after implementation of feasible mitigation measures:

- Impact AES-2: would result in long-term, substantial degradation of a scenic vista or visual character or quality of public views from implementation of the proposed treatment types (Overall WVFMP and Identified Treatment Projects)
- Impact AQ-2 and AQ-5: would result in short-term exposure of people to toxic air contaminants and odors from prescribed burning (Overall WVFMP only)
- Impact CUL-2: would potentially cause a substantial adverse change in the significance of a Tribal Cultural Resource, pending the completion of ongoing tribal consultation (Overall WVFMP and Identified Treatment Projects)

- Impact NOI-1: would temporarily expose residences within 215 feet (in the City of Berkeley) or 135 feet (in the City of Oakland) of manual, mechanical, and prescribed burning treatment activities (including pile burning) to a substantial increase in noise levels that exceed local standards (Overall WVFMP and Identified Treatment Projects)

Cumulative impacts for the issues listed above would also be significant and unavoidable (cumulatively considerable) as a result of implementation of the WVFMP.

5.2 SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

Section 15126.2(d) of the State CEQA Guidelines requires a discussion of any significant irreversible environmental changes that would be caused by the project. Section 15126.2(d) states:

> Uses of nonrenewable resources during the initial and continued phases of the project may be irreversible, because a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also, irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified.

Generally, a project would result in significant irreversible environmental changes if:

- the primary and secondary impacts would generally commit future generations to similar uses;
- the project would involve uses in which irreversible damage could result from any potential environmental accidents associated with the project;
- the project would involve a large commitment of nonrenewable resources; or
- the proposed consumption of resources is not justified (e.g., the project involves the wasteful use of energy).

The WVFMP would include implementation of the treatment activities described in Chapter 2, "Project Description," which include various methods of treating vegetation to reduce wildfire risk. Vegetation removal is generally a temporary change, and implementation of the WVFMP would not include any changes to land use or construction of any structures that would commit future generations to similar uses. Moreover, the overarching objective of the WVFMP is to avoid catastrophic wildfires that would be far more irreversible than the activities associated with the project. The WVFMP would not involve any construction that would use nonrenewable resources. Energy would be consumed for implementation of the WVFMP in the form of fossil fuel (e.g., diesel and other petroleum fuels) combustion in the engines of vehicles and equipment that would be used for vegetation removal. However, as discussed in Section 3.1.3," Resource Areas with Impacts Found Not to Be Significant," under "Energy," the WVFMP would not result in significant environmental impacts related to the unnecessary, inefficient, or wasteful use of resources. For these reasons, the WVFMP would not result in significant irreversible environmental changes.

5.3 GROWTH INDUCING IMPACTS

CEQA specifies that growth-inducing impacts of a project must be addressed in an EIR (Public Resources Code Section 21100[b][5]). Specifically, the State CEQA Guidelines (Section 15126.2[e]) states that the EIR shall discuss the ways in which the project could foster economic or population growth or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this analysis are projects that would remove obstacles to population growth (e.g., a major expansion of a wastewater treatment plant might, for example, allow for more construction in service areas). Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects. Also, the EIR should discuss the characteristics of the project which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

Direct growth inducement would result if a project involved construction of new housing. Indirect growth inducement would result, for instance, if implementing a project resulted in any of the following:

- substantial new permanent employment opportunities (e.g., commercial, industrial, or governmental enterprises);
- substantial short-term employment opportunities (e.g., construction employment) that indirectly stimulates the need for additional housing and services to support the new temporary employment demand; and/or
- removal of an obstacle to additional growth and development, such as removing a constraint on a required public utility or service (e.g., construction of a major sewer line with excess capacity through an undeveloped area).

5.3.1 Growth Inducing Impacts of the WVFMP

Recent projections indicate that the San Francisco Bay Area's population is projected to grow from 7.2 to 9.5 million people between 2010 and 2040. In comparing against actual growth, one-fourth of the projected growth already occurred between 2010 and 2015 (ABAG and MTC 2017).

UC Berkeley already maintains an approved and ongoing program of vegetation treatment and maintenance activities in the Plan Area. Past, ongoing, and planned vegetation treatments include many of the same activities included in the WVFMP. Typically, these vegetation treatment activities are carried out under contract by Facilities Services using hand crews and hand-held tools, with occasional use of machinery to cut grass and shrubs and to chip woody material.

Using a portion of the funding received by CAL FIRE California Climate Investments Fire Prevention Grant Program, Facilities Services anticipates that it will increase its implementation of treatments throughout the Plan Area. Increased employment needs for Plan implementation would be met by existing UC Berkeley staff or private contractors, as is currently done. Labor would most likely be drawn from Alameda and Contra Costa Counties. The increase in vegetation treatments that would occur with implementation of the WVFMP could slightly increase the number of people employed in Alameda and Contra Costa Counties to conduct treatment activities. The average crew size to implement treatments could include up to 15 personnel for the most labor-intensive vegetation treatment activities. The increased employment resulting from the WVFMP would be minimal. The unemployment rate in Alameda and Contra Costa Counties in early 2020 was approximately 3.0 percent, equating to approximately 1.4 million people (EDD 2020). Although comparing total unemployment to workforce needs does not account for each unemployed person's particular skills and qualifications, it is reasonable to conclude that the minimal incremental need for personnel to implement additional treatments could be met by the existing workforce. As a result, the WVFMP would not require permanent relocation to the area, and no new residential facilities would be required.

Growth in an area may also result from the removal of physical impediments or restrictions to growth, as well as the removal of planning impediments resulting from land use plans and policies. In this context, physical growth impediments may include nonexistent or inadequate access to an area or the lack of essential public services (e.g., water service), while planning impediments may include restrictive zoning and/or land use designations. The WVFMP would not include any changes to land use or zoning and would not include construction of any infrastructure (e.g., roads, water distribution, wastewater and drainage collection, and energy distribution). Therefore, there is no potential for the WVFMP to induce growth as a result of land use changes or removing obstacles to growth by expanding facility capacity.

In summary, implementation of the WVFMP could slightly increase the number of employees implementing vegetation treatments. However, because the increase in employment demand would be temporary and incremental over existing levels within Alameda and Contra Costa Counties, it is expected that the demand would be met by existing residents in the region where treatments would occur. Therefore, the WVFMP would not induce substantial direct or indirect growth.

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6 ALTERNATIVES

6.1 CEQA REQUIREMENTS FOR ALTERNATIVES

The State CEQA Guidelines Section 15126.6(a) requires EIRs to describe "… a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives. An EIR need not consider every conceivable alternative to a project. Rather, it must consider a range of potentially feasible alternatives that will avoid or substantially lessen the significant adverse impacts of a project, and foster informed decision making and public participation. An EIR is not required to consider alternatives that are infeasible. The lead agency is responsible for selecting a range of project alternatives for examination and must publicly disclose its reasoning for selecting those alternatives. There is no ironclad rule governing the nature or scope of the alternatives to be discussed other than the rule of reason." This section of the State CEQA Guidelines also provides guidance regarding what the alternatives analysis should consider. Subsection (b) further states the purpose of the alternatives analysis is as follows:

> Because an EIR must identify ways to mitigate or avoid the significant effects that a project may have on the environment (Public Resources Code [PRC] Section 21002.1), the discussion of alternatives shall focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly.

The State CEQA Guidelines require that the EIR include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed program. If an alternative would cause one or more significant effects in addition to those that would be caused by the project as proposed, the significant effects of the alternative must be discussed, but in less detail than the significant effects of the project as proposed (State CEQA Guidelines Section 15126.6[d]).

The State CEQA Guidelines further require that the "no project" alternative be considered in an EIR (Section 15126.6[e]). The purpose of describing and analyzing a no project alternative is to allow decision makers to compare the impacts of approving the proposed program with the impacts of not approving the proposed program. If the no project alternative is the environmentally superior alternative, CEQA requires that the EIR "…shall also identify an environmentally superior alternative among the other alternatives." (Section 15126[e][2]).

In defining "feasibility" (e.g., "… feasibly attain most of the basic objectives of the project …"), State CEQA Guidelines Section 15126.6(f) (1) states, in part:

> Among the factors that may be taken into account when addressing the feasibility of alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries (projects with a regionally significant impact should consider the regional context), and whether the proponent can reasonably acquire, control or otherwise have access to the alternative site (or the site is already owned by the proponent). No one of these factors establishes a fixed limit on the scope of reasonable alternatives.

In determining what alternatives should be considered in the EIR, it is important to consider the objectives of the project, the project's significant effects, and unique project considerations. These factors are crucial to the development of alternatives that meet the criteria specified in Section 15126.6(a). Although, as noted above, EIRs must contain a discussion of "potentially feasible" alternatives, the ultimate determination as to whether an alternative is feasible or infeasible is made by the lead agency's decision-making body, here the Regents of the University of California (UC Regents) (See PRC Sections 21081.5, 21081[a] [3]).

6.1.1 Summary of Alternatives Screening Criteria

In compliance with State CEQA Guidelines Section 15126.6, as described above, each alternative is evaluated in three ways:

- Does the alternative **attain most of the project objectives** (described below relative to each alternative)?
- Is the alternative **potentially feasible** (from economic, legal, regulatory, and technological standpoints)?
- Does the alternative **avoid or substantially lessen any significant effects of the proposed project** (including consideration of whether the alternative could create significant effects additional to those of the proposed project)? Significant effects are described in Sections 3.2 through 3.12 of this EIR. The WVFMP would result in the following significant and unavoidable impacts:
  - Aesthetics and Visual Resources (one significant and unavoidable impact related to long-term landscape alteration by all treatment types)
  - Air Quality (two significant and unavoidable impacts related to: 1) potential toxic air contaminants from increased prescribed burning and 2) objectionable odors from increased prescribed burning)
  - Archaeological, Historical, and Tribal Cultural Resources (one significant and unavoidable impact related to potential effects to tribal cultural resources because tribal consultation is in process and the conclusions have not been determined regarding cultural significance)
  - Noise and Vibration (one significant and unavoidable impact related to temporary exceedances of local noise standards during manual, mechanical, and prescribed burning treatment activities)

Each alternative that meets the evaluation criteria identified above is evaluated in this EIR. Those that do not meet these criteria are described in Section 6.2, "Alternatives Considered and Eliminated from Detailed Analysis."

6.1.2 Identification of Alternatives

The alternatives incorporate input provided by agencies, organizations, and individuals during review of the Notice of Preparation (NOP). The following organizations and individuals submitted comments on the NOP with suggested alternatives or alternative features for consideration in this EIR (see Appendix D for a summary of comments received on the NOP). The section in the EIR where each suggestion is considered is presented along with a description of the suggestion.

- Sierra Club provided a recommended three-pronged approach to vegetation treatment called the "3Rs," which includes vegetation removal, restoration, and reestablishment of biodiversity (see Section 6.2.3).
- East Bay Pesticide Alert suggested avoiding vegetation removal and the use of herbicides and recommended replanting previously removed eucalyptus trees (see Section 6.2.2 and Alternative B).
- San Francisco Forest Alliance recommended avoiding the use of herbicides and avoiding removal of any trees (see Section 6.2.2 and Alternative B).
- Hills Conservation Network proposed an alternative that includes implementation of evacuation route treatments, shaded fuel breaks, and fire hazard reduction treatments using only manual treatment methods (see Alternative B).
- The Claremont Canyon Conservancy suggested an alternative plan prepared and submitted by Joe R. McBride, referred here as the McBride Plan, that includes the following (see Alternative A):
  - conversion of eucalyptus and conifer plantations to native vegetation types;
  - establishment of shaded and non-shaded fuel breaks;
  - maintenance of cleared Pacific Gas & Electric (PG&E) utility corridors;
  - installation of water tanks and cameras to aid in wildfire detection and suppression; and
  - the purchase of two fire trucks, one for UC Berkeley and one for Lawrence Berkeley National Laboratory (LBNL).

- Various individuals provided several recommendations, which are summarized below:
  - Alternatives to the proposed Identified Treatment Projects, such as extending the proposed East-West Fuel Break (FB) Project west to terminate near the UC's Strawberry Softball Field, adding a Sherwood Forest Fire Hazard Reduction (FHR) Project, adding a Lower Jordan Fire Trail Evacuation Support Treatment (EST), extending the recently completed Centennial EST Project, and generally increasing the width of ESTs (some of these specific treatment projects are covered by the 2020 LRDP EIR and have already been implemented or are planned for future implementation [i.e., the EST projects], and others could be developed and implemented in the future under the WVFMP. See the WVFMP in Chapter 2 and Appendix A).
  - Remove highly flammable vegetation (e.g., eucalyptus and Monterey Pine) and replace with less flammable native flora (see the WVFMP in Chapter 2 and Appendix A).
  - Focus on structure ignition prevention, defensible space treatments, and prohibit development in high wildfire risk areas (see Section 6.2.1).
  - Rather than treating vegetation in the Plan Area, allow overgrowth and plant more disease resistant, drought tolerant trees (see Section 6.2.2).
  - Prohibit the use of herbicides across the UC Berkeley campus (see Alternative B).

The UC Regents reviewed and considered recommendations regarding alternatives provided in response to the NOP. Recommendations that were considered and eliminated from detailed analysis because they do not meet the alternatives screening criteria are described in Section 6.2. Recommendations that were consistent with the alternatives screening criteria were incorporated into the alternatives evaluated in this EIR; these are described and evaluated in Section 6.3.

6.2 ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED ANALYSIS

As described above, State CEQA Guidelines Section 15126.6(c) provides that the range of potential alternatives for a project shall include those that could feasibly attain most of the basic objectives of the project, and could avoid or substantially lessen one or more of the significant effects. Alternatives that fail to meet the fundamental project purpose need not be addressed in detail in an EIR. (*In re Bay-Delta Programmatic Environmental Impact Report Coordinated Proceedings* (2008) 43 Cal.4th 1143, 1165-1167.)

In determining what alternatives should be considered in an EIR, it is important to acknowledge the objectives of the project, the project's significant effects, and any unique project considerations. These factors are crucial to the development of alternatives that meet the criteria specified in Section 15126.6(a). Although, as noted above, EIRs must contain a discussion of "potentially feasible" alternatives, the ultimate determination as to whether an alternative is feasible or infeasible is made by lead agency's decision-making body (see PRC Section 21081(a)(3).)

The EIR should also identify any alternatives that were considered by the lead agency, but were rejected during the planning or scoping process and briefly explain the reasons underlying the lead agency's determination (State CEQA Guidelines Section 15126.6(c)). Several commenters identified potential alternatives to the WVFMP in response to the NOP (see Section 6.1.2). Comments that suggest alternatives to the WVFMP were evaluated against the alternatives screening criteria described in Section 6.1.1. Suggested alternatives that are consistent with the screening criteria are evaluated in Section 6.3. The following sections describe the alternatives that were considered by the UC Regents but are not evaluated further in this EIR and the reasons for eliminating each from detailed analysis in the EIR.

6.2.1 Non-Vegetation Management Wildfire Risk Reduction Alternatives

Several comments on the NOP suggested that the EIR should consider an approach that reduces wildfire risks to life, property, and natural resources through methods that do not involve vegetation management (called "non-vegetation" management alternatives in this EIR). These comments recommended non-vegetation management techniques for reducing wildfire risk, including preventing structure ignition, retrofitting existing structures to reduce their potential for ignition during a wildfire and prohibiting development in high fire risk areas.

State, federal, and local agencies implement a wide range of programs, pursuant to various governing regulations, to reduce wildfire risks to life, property, and natural resources. These programs include various vegetation management activities, as well as non-vegetation management approaches similar to the techniques suggested in comments. For example, the California Board of Forestry and Fire Protection (Board) is responsible for identifying very high fire hazard severity zones (VHFHSZs) in the SRA and LRA. Local agencies are required to designate, by ordinance, VHFHSZs and to require landowners to reduce fire hazards adjacent to occupied buildings within these zones (Government Code Sections 51179 and 51182). The intent of identifying areas with very high fire hazards is to allow the California Department of Forestry and Fire Protection (CAL FIRE) and local agencies to develop and implement measures that would reduce the loss of life and property from uncontrolled wildfires (Government Code Section 51176).

PRC Section 4290 authorizes the Board to establish minimum fire safety standards for development in the SRA. These standards provide for defensible space relating to road standards for fire equipment access; standards for signs identifying streets, roads, and buildings; minimum private water supply reserves for emergency fire use; and standards for fuel breaks and greenbelts. PRC Section 4291 gives CAL FIRE the authority to enforce 100 feet of defensible space around all buildings and structures on non-federal SRA lands, or non-federal forest-covered lands, brush-covered lands, grass-covered lands, or any land that is covered with flammable material. PRC Section 4562 mandates that the Board adopt fire protection zones where specific protection measures are to be identified, including vegetation treatments within and adjacent to timber operations. Government Code Section 65302.5 gives the Board the regulatory authority to evaluate General Plan Safety Elements for their land use policies in the SRA and VHFHSZs, as well as methods and strategies for wildland fire risk reduction and prevention in those areas, which includes projects potentially covered by this EIR.

The Office of the State Fire Marshal is responsible for proposing fire prevention building standards (Health and Safety Code Section 13108.5) for roofs; exterior walls; structure projections, including, but not limited to, porches, decks, balconies, and eaves; and structure openings, including, but not limited to, attic and eave vents and windows, of buildings located in the Wildland Urban Interface Fire Areas as defined by California Fire Code Section 702A.

The non-vegetation management approaches suggested in comments are consistent with other state, federal, and local governing regulations and programs, but they are not analyzed as alternatives in this EIR because these approaches would not attain the majority of the objectives of the WVFMP, which are inherently focused on managing and strategically reducing vegetation as an integral component of statewide wildfire risk reduction efforts. The following WVFMP objectives involve some degree of vegetation treatment: manage vegetation in the Hill Campus to substantially reduce wildfire risk (Objective 1); contribute to the statewide goal of increasing the pace and scale of vegetation treatment activities pursuant to Executive Order (EO) B-52-12 (Objective 3); substantially reduce highly flammable invasive plant species and promote the growth of fire-resistant native plants (Objective 4); enhance evacuation routes and access for emergency fire suppression activities (Objective 5); increase the efficiency of vegetation treatments by providing a variety of vegetation treatment types and activities that can be selected (Objective 6); implement an adaptive management framework to promote the long-term effectiveness of vegetation management activities (Objective 7); and maximize the long-term effectiveness of initial vegetation treatments to responsibly use the limited grant funds that are available (Objective 8). The non-vegetation management alternatives would not meet these objectives because, by definition, they are not vegetation management and therefore would not attain any of the outcomes identified in these objectives through vegetation management. The non-vegetation management alternatives could partially attain Objective 2, which calls for greenhouse gas (GHG) emissions reduction through reducing the occurrence and severity of future wildfire emissions and increasing carbon sequestration. Non-vegetation management techniques for reducing wildfire risk, such as retrofitting existing structures, would help to reduce the occurrence and severity of future wildfires and associated emissions; however, they would not increase carbon sequestration.

The non-vegetation management approaches recommended in the comments are currently enacted under existing programs and pursuant to existing governing regulations intended to reduce the risk and effects of wildfire. These types of alternatives would occur in combination with the WVFMP, and are not necessary or appropriate to be a part of the WVFMP. For the purposes of CEQA, non-vegetation management alternatives are not evaluated in detail in this EIR because these alternatives would not meet most of the objectives of the WVFMP.

6.2.2 No Vegetation Treatment/Increased Vegetative Growth and Replanting Alternatives

Several comments on the NOP recommended that UC Berkeley take an approach to wildfire risk reduction in the Hill Campus that doesn't involve any vegetation removal and instead allows vegetation to continue to grow and suggests planting more disease resistant, drought tolerant trees, and replanting previously removed eucalyptus trees. Because there would be no vegetation removal, these alternative would avoid the significant and unavoidable impacts associated with equipment use, prescribed burning, and implementation of some of the proposed treatment types (i.e., fuel breaks and temporary refuge areas). However, for the same reason they would avoid significant impacts, they would not meet any of the objectives of the WVFMP, which are focused primarily on managing vegetation to decrease the risk of wildfire, reduce highly flammable invasive plant species, minimize future wildfire emissions, improve emergency evacuation and fire suppression, and increase the efficiency of vegetation treatments. Retaining and increasing vegetation, especially eucalyptus, would increase wildfire risk. No vegetation treatment/increased vegetative growth and replanting alternatives are not evaluated in detail in this EIR because these alternatives would not meet any of the objectives of the WVFMP.

6.2.3 Sierra Club's 3 R's Alternative

The Sierra Club submitted a comment on the NOP that included a suggested alternative referred to as the "3 R's Alternative." This alternative calls for the removal of blue gum eucalyptus and other fire dangerous trees which would allow for the restoration and recovery of native vegetation that is less fire dangerous and the reestablishment of the biodiversity that existed within the native habitat. The alternative would remove all eucalyptus trees in areas of high fire danger and includes the use of herbicides applied by hand on eucalyptus stumps to prevent regrowth. Treated areas would be restored with fire safe native trees and vegetation, such as bays, oaks, laurels, and native grasslands and flowers. Biomass would be chipped and spread onto treated areas to decompose.

UC Berkeley considers many of the elements of the Sierra Club's suggested alternative to be effective in wildfire risk reduction and has integrated them into the WVFMP; these include the Sierra Club's suggestion to remove invasive vegetation, such as eucalyptus trees and treat stumps with herbicides to prevent regrowth, and restore treated areas with fire resistant native vegetation. Similar to the WVFMP, this alternative would include manual and mechanical treatments, so, it would not avoid significant and unavoidable impacts related to air quality and noise. This alternative proposes removal of all eucalyptus in several locations; therefore, it would not avoid significant and unavoidable impacts related to aesthetics and visual resources. In addition, this alternative would not meet many of the objectives of the WVFMP, such as enhancing evacuation routes and access for emergency fire suppression, increasing the efficiency of treatments by providing a variety of treatment activities to choose from, and implementing an adaptive management framework (Objective 5 through 7). Furthermore, this alternative would only partially meet the other objectives of the WVFMP due to the limited treatment types and treatment activities that could be used. Because many of the elements of this alternative have been integrated into the WVFMP and the remainder would not meet most of the objectives, and as a whole it would not avoid or substantially lessen any significant effects of the WVFMP, this alternative is not evaluated in detail in this EIR.

6.2.4 Vegetation Treatment Setbacks Near Residential Areas Alternative

This alternative was considered by UC Berkeley to address significant and unavoidable noise impacts related to temporary exceedances of local noise standards during manual, mechanical, and prescribed burning treatment activities. This alternative would implement the same treatment types and activities within the Plan Area as the WVFMP. However, UC Berkeley would establish a distance (setback) from residences within which hand-operated power tools and heavy equipment would not be used and water tenders for prescribed burning activities would not be staged. This would affect what vegetation treatment activities could occur in portions of the Plan Area that are adjacent to residential areas; within the established setbacks, no mechanical treatments could occur, no chainsaws would be used, and no water tenders could be staged. Managed herbivory and herbicide application could occur without limitation. Accordingly, two of the Identified Treatment Projects would be altered from the WVFMP. Treatment activities in portions of the Strawberry Fire Hazard Reduction (FHR) Project and the East-West Fuel Break near residential areas would include manual treatments (without the use of chainsaws) and herbicide application, rather than rely on mechanical treatment activities. Therefore, in these areas, it is unlikely that UC Berkeley would be able to fully accomplish treatment goals without the use of chainsaws and mechanical equipment to enable the removal of large trees and other vegetation.

Although significant noise impacts would be avoided by this alternative, prohibiting specific vegetation treatment activities and reducing the effectiveness of treatments near residences would prevent UC Berkeley from fully accomplishing the primary objective of the WVFMP, which is to substantially reduce risk to life and property from wildfire through vegetation management (Objective 1). In addition, this alternative would only partially meet all of the other objectives of the WVFMP because of restrictions on the types of equipment and treatment activities that could be used. Therefore, this alternative is not evaluated in detail in this EIR.

6.2.5 Alternatives Dismissed in the 2014 FEMA EIS

The 2014 Hazardous Fire Risk Reduction Environmental Impact Statement prepared by the Federal Emergency Management Agency (2014 FEMA EIS) considered but eliminated the following alternatives from detailed review:

- Alternative Hazardous Fuel Reduction Program:
  - Removal of brush, surface fuels, lower limbs, and small trees
  - Removal of eucalyptus debris after a freeze
  - Keeping grass short
- Specific Wildfire Hazard Reduction Measures:
  - Creation of defensible space around structures
  - Improvement of firefighting capacity, equipment, and tactics
  - Installing exterior sprinkler systems
  - Roof replacement
  - Management of resprouts from stumps without using herbicides
- Broadcast Burning Only

Elements of the vegetation treatment related alternatives were incorporated into the alternatives in this EIR (e.g., management of resprouts without using herbicides is incorporated into Alternative B). The non-vegetation treatment alternatives are not evaluated in detail in this EIR for the same reasons they were not evaluated in detail in the 2014 FEMA EIS. The 2014 FEMA EIS explained why these alternatives were not evaluated, which include that some would rely on public participation and be difficult to enforce, they don’t address vegetative fuels in undeveloped areas or effectively reduce wildfire risk, economic infeasibility, inability to meet the Purpose and Need of the project, and some were already components of the Proposed and Connected Actions (FEMA 2014). Specifically, creation of defensible space around structures was not evaluated because it relies on participation by homeowners and sufficient funding for compliance and enforcement. In addition, it does not address vegetative fuels in undeveloped areas, which could spread wildfire into developed areas regardless of defensible space during a Diablo-wind-driven wildfire event. Improvements in firefighting capacity, equipment, and tactics are acknowledged as an important component of fire risk reduction; however, they would not address existing wildfire hazards (i.e., vegetative fuel) and alone, would not be enough to overcome a major wildfire driven by Diablo winds. Use of exterior sprinkler systems and roof replacement were also dismissed because alone they would not be effective at preventing the spread of a high-intensity, Diablo-wind-driven wildfire and would be prohibitively expensive to implement.

6.2.6 Alternatives Evaluated in 2014 FEMA EIS

The 2014 FEMA EIS evaluated a No Action Alternative and the Proposed and Connected Actions. The Proposed and Connected Actions involved vegetation management work in 105 defined project areas. Sixty of the 105 project areas were proposed in four grant applications submitted to FEMA by UC Berkeley, the East Bay Regional Park District (EBRPD), and the City of Oakland. Additional vegetation work proposed included activities that are not eligible for FEMA funding, such as pile burning and broadcast burning proposed by EBRPD. In the EIS, the combination of vegetation management activities proposed for FEMA funding (the grant applications) and the activities proposed to be funded by others on the 60 project areas were identified as the Proposed Action. Additional connected actions were proposed by EBRPD in areas near the Proposed Action project areas. Because UC Berkeley does not have jurisdiction over City of Oakland or EBRPD lands, the description of the Proposed and Connection Actions is focused on the treatments proposed on UC Berkeley lands.

UC Berkeley submitted two grant applications for vegetation management work in Strawberry Canyon (56.3 acres) and in Claremont Canyon (42.8 acres) as part of the FEMA-funded work. UC Berkeley proposed to remove eucalyptus, Monterey pine, and other non-native trees that are fire-prone and susceptible to torching. Oak and bay trees and other native vegetation present under the larger non-native, fire-prone trees would be preserved and encouraged to expand. The same general approach to vegetation management was also proposed on Frowning Ridge, although it was not eligible for grant funding at the time. The total area within UC Berkeley's jurisdiction that was proposed for treatment included approximately 285 acres of the Hill Campus.

The projects included in the Proposed and Connected Actions that were proposed within the Hill Campus have been incorporated into the WVFMP as the Strawberry, Claremont, and Frowning FHR projects. In comparison to the Proposed and Connected Actions from the FEMA EIS, the WVFMP would better attain the primary objective of the Plan, which is to substantially reduce risk to life, property, and natural resources by managing the amount and continuity of vegetation in the Hill Campus. This is because the WVFMP includes additional fuel reduction projects (i.e., the temporary refuge area and fuel break Identified Treatment Projects) and includes multiple treatment types and activities that could be implemented across the Hill Campus. Although the Proposed and Connected Actions evaluated in the 2014 FEMA EIS is not evaluated as an alternative in this EIR, relevant and feasible components of the alternative (i.e., those proposed within the Hill Campus) have been integrated into this EIR.

6.3 ALTERNATIVES EVALUATED IN THIS EIR

The following alternatives are evaluated in this EIR.

- **No Project Alternative** assumes that UC Berkeley would continue to implement treatments through the existing UC Berkeley 2020 Hill Area Fire Fuel Management Program that are covered under UC Berkeley's 2020 Long Range Development Plan (LRDP) EIR. Fewer treatment types and treatment activities would be implemented on fewer acres annually in comparison to the WVFMP. The proposed Identified Treatment Projects would not be implemented.

- **Alternative A: The McBride Plan Alternative** would treat 400-500 acres of vegetation in the Hill Campus with a combination of eucalyptus and conifer conversion projects, creation of fuel breaks, maintenance of cleared utility corridors, installation of new fire detecting and suppression infrastructure; and the purchase of new fire detection and suppression equipment.
- **Alternative B: The Reduced Treatment Alternative** would limit treatments to removal of ground fuels, fire ladder components, and small diameter trees using manual treatment methods. This alternative would implement evacuation route treatments, shaded fuel breaks, and fire hazard reduction treatments within 200 feet of structures and roadways.

These alternatives are described in detail below; descriptions focus on the identification of elements that differ from the WVFMP. Following the description of each alternative is an evaluation of the degree to which the alternative meets the objectives of the WVFMP, and an analysis of the environmental impacts of each alternative. Table 6-2 at the end of Section 6.4 presents a comparison of the environmental effects of each alternative relative to the WVFMP. It identifies whether an alternative would avoid any significant and unavoidable impact of the Plan and presents the degree of environmental effects relative to the Plan (e.g., similar, less, greater) for each resource area.

6.3.1 No Project Alternative

ALTERNATIVE DESCRIPTION

Under the No Project Alternative, UC Berkeley would continue to implement vegetation treatments through the existing UC Berkeley 2020 Hill Area Fire Fuel Management Program that are covered under the 2020 Long Range Development Plan Environmental Impact Report (2020 LRDP EIR). CEQA Guidelines Section 15126.6(e)(2) states that the no project alternative shall describe "what would be reasonably expected to occur in the foreseeable future if the project were not approved." For the revision of a regulatory plan, policy or ongoing operation, "the no project alternative will be continuation of the existing plan, policy, or operation into the future." (CEQA Guidelines Section 15126[e][3][A]).

Ongoing and planned vegetation treatments described in the existing 2020 Hill Area Fire Fuel Management Program that would occur in the Plan Area under the No Project Alternative include defensible space and roadside treatments; evacuation support treatments; roadside turnout and signpost treatments; exotic plant removal; hazard tree removal; and tree planting (i.e., replacing flammable vegetation with more fire-resistant vegetation). These vegetation treatments would be implemented using manual treatment activities (i.e., hand crews and hand-held tools and machinery to reduce vegetation and chip/masticate woody material). Herbicides would be applied to roadside vegetation and tree stumps by hand to prevent any resprouting, and targeting grazing by livestock would occur to manage grasslands and areas of shrub dominated vegetation.

The No Project Alternative includes most of the treatment activities proposed in WVFMP; however, the No Project Alternative would not use prescribed burning. In addition, under the No Project Alternative, there would be no fuel break treatments, fire hazard reduction treatments, or creation of temporary refuge areas. Any future treatment projects that are proposed that differ from those included in the 2020 Hill Area Fire Fuel Management Program and are not covered by the 2020 LRDP EIR or otherwise exempt from CEQA could require preparation of separate, project-specific CEQA documents before implementation.

Treatments under the No Project Alternative would be expected to occur throughout the same Plan Area shown on Figure 2-1 in Chapter 2, "Project Description." However, the extent and frequency of treatments would be limited by the types of vegetation treatments that are approved to occur, and potentially by the need to complete project-level environmental review for any proposed vegetation treatments not covered under the 2020 LRDP EIR.

Consistency with Plan Objectives

CEQA requires that an EIR evaluate a no project alternative to allow decisionmakers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project, even if the no project alternative does not meet most of the basic project objectives (State CEQA Guidelines Section 15126[e]).

The No Project Alternative would result in the continuation of ongoing vegetation treatment types and activities that currently occur in the Hill Campus. The No Project would be consistent with the objectives that call for vegetation treatments to substantially reduce wildfire risk through vegetation management; reductions in the occurrence and severity of future wildfire and associated GHG emissions; substantial reduction in highly flammable invasive plant species and promoting the growth of fire-resistant native vegetation; enhancements to evacuation routes and access for emergency fire suppression activities; and maximizing the long-term effectiveness of initial vegetation treatments. However, because the No Project Alternative would not utilize prescribed burning or implement fire hazard reduction treatments or fuel breaks it would attain these objectives but to a lesser degree than the WVFMP.

The No Project Alternative would not be consistent with objectives that call for increasing the pace and scale of vegetation treatments, increasing the efficiency of vegetation treatments, and implementation of an adaptive management framework. The No Project would not increase the pace or scale of vegetation treatments above existing conditions nor does it include an adaptive management framework to increase the long-term effectiveness of vegetation management in the Hill Campus. Overall, the No Project Alternative would attain most of the basic objectives of the WVFMP, but to a lesser degree than the WVFMP.

Feasibility

The No Project Alternative would reflect a continuation of current vegetation management practices. Because the No Project Alternative would involve limited changes from existing practices, the alternative would be feasible to implement; however, it would not feasibly attain many of the basic objectives of the WVFMP.

ENVIRONMENTAL ANALYSIS OF THE NO PROJECT ALTERNATIVE

Aesthetics

Under the No Project Alternative, UC Berkeley would continue to implement vegetation treatments in the Plan Area; however, there would be no fuel break treatments, fire hazard reduction treatments, or creation of temporary refuge areas. In addition, no prescribed burning would occur under the No Project Alternative. As with the WVFMP, temporary adverse visual effects would occur during implementation of treatments from the presence of equipment and vehicles, but they would be less than the WVFMP because there would be no prescribed burning and associated potential for smoke and the extent and frequency of treatments would be limited by the types of vegetation treatments that are approved to occur. Long-term visual effects would also be reduced under the No Project Alternative due to the lack of fuel breaks, fire hazard reduction treatments, and temporary refuge areas; however, the same significant and unavoidable impact identified for the WVFMP would occur due to long-term visual changes from landscape alteration under the No Project Alternative. Therefore, on balance, the effects to aesthetics and visual resources under the No Project Alternative would be *less than* the WVFMP.

Air Quality

The No Project Alternative would result in similar emissions generating activities as the WVFMP to implement ongoing vegetation treatments in the Plan Area. Like the WVFMP, temporary and short-term air quality emissions would occur from site preparation and use of equipment and vehicles, although emissions would be less than the WVFMP because no prescribed burning would occur and the extent and frequency of treatments are limited by the types of vegetation treatments that are approved to occur. In addition, because prescribed burning would not be conducted under the No Project Alternative, it would avoid the significant and unavoidable impacts related to potentially exposing people to toxic air contaminants and odors from prescribed burning under the WVFMP. Therefore, effects to air quality under the No Project Alternative would be *less than* the WVFMP.

Archaeological, Historical, and Tribal Cultural Resources

Similar to the WVFMP, the No Project Alternative would implement ground disturbing activities that could disturb human remains, if present in a treatment area. As with the WVFMP, compliance with California Health and Safety Code Sections 7050.5 and 7052 and PRC Section 5097 would minimize the disturbance of any human remains and require the appropriate treatment of remains that are discovered under the No Project Alternative. Similar to the

WVFMP, unknown unique archaeological resources or subsurface historical resources also could be inadvertently discovered during ground disturbing treatment activities under the No Project Alternative, and UC Berkeley would implement measures to minimize and avoid damage to any discovered resources. However, because the extent and frequency of treatments under the No Project Alternative are limited by the treatment types approved to occur, and no prescribed burning would be conducted, impacts to archaeological, historical, and tribal cultural resources would be *less than* the WVFMP.

Biological Resources

Like the WVFMP, vegetation treatment under the No Project Alternative could affect special-status plant and animal species, result in the degradation of riparian habitat or other sensitive natural communities, adversely affect wetlands, and interfere with wildlife movement corridors or impede the use of nurseries. Under the No Project Alternative, 2020 LRDP EIR Continuing Best Practices and mitigation measures would be implemented, which include measures to minimize and avoid impacts to special-status species and habitats, wetlands, and wildlife corridors and nursery sites. Because the extent and frequency of treatments under the No Project Alternative are limited by the treatment types approved to occur, and no prescribed burning would be conducted, impacts to biological resources would be *less than* the WVFMP. However, treatments under the No Project Alternative would not improve native habitat in the long term for some special-status species, including Alameda Whipsnake, to the same extent as the WVFMP.

Geology and Soils

Like the WVFMP, the No Project Alternative would disturb soils and reduce vegetative cover, which has the potential to increase the rates of erosion, disturb topsoil, and destabilize slopes, which would increase the risk of landslides. However, compliance with 2020 LRDP EIR Continuing Best Practices as described in the 2020 LRDP EIR would avoid and minimize these impacts. In addition, because the extent and frequency of treatments under the No Project Alternative are limited by the treatment types approved to occur, and no prescribed burning would be conducted, impacts related to geology and soils would be slightly *less than* the WVFMP.

Greenhouse Gas Emissions and Climate Change

The No Project Alternative would include many of the same GHG emissions-generating activities and sources as the WVFMP, such as from equipment and vehicle use. However, because there would be fewer treatments and no prescribed burning would be conducted under the No Project Alternative, direct GHG emissions from treatment activities would be reduced. Treatment activities under the No Project Alternative would reduce wildfire risk in the Hill Campus, which would be expected to reduce future GHG emissions from wildfires and increase carbon sequestration in the long term. This would be consistent with applicable plans, policies, and regulations adopted for the purpose of reducing the emissions of GHGs. However, because the extent and frequency of treatments under the No Project Alternative are limited by the treatment types approved to occur, and no fuel breaks or fire hazard reduction treatments would occur, it would not reduce wildfire risk to the same extent as the WVFMP and therefore could result in less potential long-term GHG emission reduction and carbon sequestration benefits. Even though short-term GHG emissions would be less under the No Project Alternative, because potential long-term GHG emissions reduction and carbon sequestration benefits would be reduced, the GHG impact would be potentially *greater than* the WVFMP.

Hazards and Hazardous Materials

Like the WVFMP, the No Project Alternative would include the transportation, use, storage, and disposal of various hazardous substances, including fuels and oils to operate vehicles and equipment and herbicides. Use of these substances could result in risks related to human exposure if any leaks or spills were to occur or in the case of herbicides, when applied in areas in close proximity to the public. The No Project Alternative would also include compliance with applicable laws and regulations that reduce the risks associated with the use of hazardous materials, including herbicides. Under the No Project Alternative, the extent and duration of treatments are limited by the treatment types that are approved to occur, and fewer herbicides are approved for use. Therefore, the transportation, use, storage, and disposal of hazardous materials would be reduced under the No Project Alternative and impacts related to hazards and hazardous materials would be slightly *less than* the WVFMP.

Hydrology and Water Quality

Manual and mechanical treatment activities under the No Project Alternative would have similar potential to violate water quality standards or waste discharge requirements, substantially degrade surface or ground water quality, or conflict with or obstruct the implementation of a water quality control plan as the WVFMP. These effects would be minimized through compliance with applicable laws and regulations. Unlike the WVFMP, the No Project Alternative would not conduct prescribed broadcast burns or pile burning and thus would avoid potential impacts associated with ash and other sediment entering watercourses and degrading water quality. Therefore, impacts to hydrology and water quality under the No Project Alternative would be *less than* the WVFMP.

Noise

Like the WVFMP, short-term noise generated by the use of manual equipment (i.e., chainsaws) and mechanical equipment under the No Project Alternative would occur. Because the No Project Alternative would implement manual and mechanical vegetation treatments within the same Plan Area as the WVFMP, local noise standards could be exceeded when conducted in close proximity to residential land uses. Because local noise standards could be exceeded, the No Project Alternative would result in the same significant and unavoidable impact as the WVFMP. However, the extent and frequency of treatments would be limited by the treatment types approved for use under the No Project Alternative and no prescribed burning would be conducted, thus, associated short-term noise impacts would be reduced and avoided, respectively, relative to the WVFMP. Therefore, impacts related to noise and vibration would be slightly *less than* the WVFMP.

Recreation

Similar to the WVFMP, during the implementation of vegetation treatments under the No Project Alternative, impacts to recreation could occur as result of temporary access restrictions when equipment use or staging occurs within or immediately adjacent to a public trail, or as a result of nuisance impacts, such as noise, dust emissions, or degradation of views. UC Berkeley 2020 LRDP EIR Continuing Best Practices would be implemented to reduce impacts from temporary access restrictions as well as short-term impacts related to noise, dust, and degradation of views. In addition, there would be no prescribed burning under the No Project Alternative, fewer herbicides would be approved for use, and the overall extent and frequency of treatments would be limited by the treatment types approved for use. Therefore, potential public access restrictions and nuisance impacts would be reduced relative to the WVFMP. Impacts to recreation under the No Project Alternative would be *less than* the WVFMP.

Wildfire

Like the WVFMP, the No Project Alternative would conduct treatment activities using mechanical equipment within vegetated areas, which has the potential to ignite surrounding vegetation. Treatments carried out under the No Project Alternative would comply with standard practices to reduce wildfire risk when using mechanical equipment in vegetated areas. Unlike the WVFMP, no prescribed burning would be conducted under the No Project Alternative, and fewer overall treatments would be expected to occur due to the reduced treatment types and activities that are approved under the No Project Alternative. Thus, the potential to exacerbate fire risk during treatments or result in post-fire landslides or flooding would be reduced and avoided, respectively, relative to the WVFMP. However, over the long term, the risk of the uncontrollable spread of wildfire and associated post-wildfire landslides or flooding would be greater under the No Project Alternative than under the WVFMP because the No Project Alternative would not create fuel breaks, which aid in the containment of a wildfire and reduce the likelihood of crown fire transition, nor would fire hazard reduction treatments occur, which would focus on reducing hazardous fire conditions in the Plan Area. In addition, because the extent and frequency of treatments would be limited by the types of vegetation treatments that are approved to occur under the No Project Alternative, less fuel reduction would occur leaving greater amounts of wildfire fuels in the Hill Campus, which would also increase the risk of the uncontrollable spread of wildfire and associated post-wildfire risks such as landslides and flooding. Therefore, impacts related to wildfire would be *greater than* the WVFMP.

6.3.2 Alternative A: The McBride Plan Alternative

ALTERNATIVE DESCRIPTION

The plan comprising Alternative A, known as the McBride Plan, was submitted as a comment on the NOP and it received support from the Claremont Canyon Conservancy as well as from individual commenters (McBride 2019); it is included as Appendix I to this EIR. Alternative A includes the initial treatment of 400 to 500 acres across Strawberry Canyon and Claremont Canyon according to management prescriptions, which include the conversion of eucalyptus and conifer plantations to native vegetation; establishment of a 300-foot-wide primarily non-shaded fuel break along the ridgeline between Strawberry and Claremont canyons; establishment of non-shaded fuel breaks within 20 feet of the edges of existing roads within the Hill Campus; establishment of shaded fuel breaks around UC Berkeley facilities and buildings; cleanup and maintenance of remaining conifer plantations; and establishment of an Alameda whipsnake preserve on the upper south facing slopes of Strawberry Canyon. Figures depicting the locations of each of the treatments are included in Appendix I.

This alternative also includes vegetation monitoring and maintenance along existing cleared areas such as PG&E utility corridors and previously treated evacuation routes. State and federal law require utilities to manage vegetation around powerlines. PRC Sections 4292 and 4293 establish minimum required fuel breaks surrounding utility poles and power lines, and is enforced by CAL FIRE. California Public Utilities Commission (CPUC) General Order 95 establishes additional year-round clearance requirements below powerlines, including those owned by PG&E. CPUC Resolution ESRB-4 directs utilities to take additional measures to reduce the risk of fire, including increasing vegetation inspections; removing hazardous, dead and diseased trees and other vegetation near electric power lines and poles; sharing resources with CAL FIRE to staff lookouts adjacent to the utilities' property; and clearing access roads under power lines for fire truck access. UC Berkeley coordinates with PG&E regarding operation and maintenance of PG&E utilities in the Hill Campus. Treatments implemented under the WVFMP could encompass utility corridors in the Hill Campus, in coordination with PG&E. However, PG&E is legally required to manage the vegetation within its corridors to minimize fire risk. Therefore, this component of Alternative A is not analyzed in this EIR as an alternative to the WVFMP. The analysis below focuses on the other components of this alternative that differ from the WVFMP and are not currently legally required irrespective of WVFMP implementation.

In addition to vegetation treatments, Alternative A includes infrastructure improvements and new equipment for improved wildfire detection and suppression. Under Alternative A, additional water tanks would be installed along Grizzly Peak Boulevard and existing water storage facilities would be evaluated and improved, if deemed necessary. In addition, two Type 3 fire trucks would be purchased, one for UC Berkeley and one for LBNL for use in fighting wildfires. Fire roads throughout both Strawberry and Claremont canyons would be modified, where necessary, to accommodate the Type 3 fire engines purchased. Under Alternative A, sites would be made available for PG&E to install fire detection cameras throughout Strawberry and Claremont Canyons.

The management prescriptions under Alternative A would be accomplished through manual and mechanical treatment activities, herbicide application, and managed herbivory using goats. This alternative also includes follow-up monitoring and maintenance at specified intervals that vary depending on the management prescription. The management prescriptions and associated treatment activities and maintenance intervals under Alternative A are summarized in Table 6-1, below.

Under Alternative A, biomass created through vegetation removal would be hauled to a central location or stacked in an appropriate opening (grass-dominated opening at least 30 feet in diameter) where it would be burned in piles, gasified, or converted to biochar (a charcoal-like substance produced by burning plant matter). No chipping or mastication of biomass and reuse onsite would occur. Because no chipping or mastication would be used, substantially more pile burning would be required to dispose of biomass than would occur under the WVFMP.

Table 6-1 Summary of Management Prescriptions Under Alternative A

Management Prescription	Implementation Methods	Treatment Activities[1]	Maintenance Activities and Frequency
Conversion of eucalyptus plantations to native vegetation	Tree and sprout removal	Manual and mechanical treatment, herbicide use, goat grazing	Removal of resprouts every 5 years
Conversion of conifer plantations on ridgetops to native vegetation (some conversion to shaded fuel breaks)	Tree removal	Manual and mechanical treatment, herbicide use, goat grazing	Tree thinning, pruning, ground fuel removal, goat grazing every 5 years
Roadside fuel breaks (Grizzly Peak Blvd., Claremont Ave., Centennial Dr., and unpaved fire roads)	Brush/shrub removal within 20 feet on either side of roads	Manual and mechanical treatment	Grass mowing and/or goat grazing every year, ground fuel removal
Shaded fuel breaks adjacent to facilities and structures	Tree thinning, pruning, and ground fuel removal	Manual and mechanical treatment	Tree thinning, pruning, and ground fuel removal every 5 years
Shaded and non-shaded ridgetop fuel break between Strawberry and Claremont canyons	Tree and brush removal to create a 300-foot-wide fuel break	Manual and mechanical treatment	Grass mowing and/or goat grazing (non-shaded portions) every year Tree thinning, pruning, and ground fuel removal (shaded portions) every 5 years
Treatment and maintenance of remaining conifer plantations	Ground fuel removal, pruning, elimination of fuel ladders	Manual treatment	Tree thinning, pruning, and ground fuel removal every 5 years
Creation of Alameda whipsnake preserve	Tree and broom removal	Manual and mechanical treatment	Removal of trees and broom every 10 years
Maintenance along existing power lines	Annually monitor power lines and maintain clearance of tree branches	Manual treatment	Annually monitor power lines and maintain clearance of tree branches
Maintenance along evacuation routes (Grizzly Peak Blvd., Claremont Ave., and Centennial Dr.)	Hazard tree removal	Manual and mechanical treatment	Tree inspections and removal every 5 years

[1] Specific treatment activities are not specified for each management prescription in the McBride Plan. Where treatment activities were not specified, they are assumed based on the implementation methods provided.

Source: McBride 2019 (Summarized by Ascent Environmental in 2020)

Many of the management prescriptions proposed under Alternative A are similar to vegetation treatments currently being implemented by UC Berkeley within the Plan Area or to those proposed in the WVFMP. As described in Section 2.4 of Chapter 2, "Project Description," defensible space treatments are ongoing in the Hill Campus and involve vegetation removal in areas within 100 feet of any structure, consistent with California State PRC 4291, which is similar to vegetation thinning around facilities and structures proposed under Alternative A. Roadside treatments are currently implemented within 15 feet of either side of major roads and trails within and bounding the Plan Area and evacuation support treatments are currently implemented up to 100 feet on either side of evacuation routes to remove highly flammable vegetation and trees that may block access/egress should they fall. Ongoing roadside and evacuation support treatments are similar to the roadside fuel breaks and evacuation route maintenance proposed under Alternative A, although the distance from the road in which vegetation would be removed by UC Berkeley would be substantially less under Alternative A. UC Berkeley currently removes exotic trees and vegetation, including eucalyptus, Monterey pine, and French broom seedlings, which is similar to the eucalyptus and conifer conversion under Alternative A, although the locations and areal extent of specific treatments may differ. In addition, the WVFMP includes evacuation support treatments, fire hazard reduction treatments (which would remove eucalyptus and other highly flammable invasive species), and shaded and non-shaded fuel breaks. Although many of the management prescriptions under Alternative A are already occurring in the Plan Area and/or are included in the WVFMP, some locations and areal extent of specific treatment projects, such as fuel breaks, differ between Alternative A and the WVFMP.

Similar to the WVFMP, Alternative A would treat vegetation using manual and mechanical treatment activities, herbicide use, and managed herbivory. Unlike the WVFMP, no broadcast burning would be used and no temporary refuge areas would be created under Alternative A. Pile burning of biomass would need to substantially increase relative to the WVFMP to remove cut vegetation because of the lack of chipping/masticating of biomass under Alternative A. Unlike the WVFMP, Alternative A proposes infrastructure improvements (i.e., installation of water tanks and locations for wildfire monitoring equipment), and the purchase of two fire engines, one for LBNL and one for UC Berkeley, for fire suppression.

In summary, the key differences between the McBride Plan and the WVFMP, which are considered in the environmental analysis below, are:

- No broadcast prescribed burning would be conducted.
- No temporary refuge areas would be developed.
- No chipping of biomass or reuse onsite would occur; accordingly, pile burning would substantially increase relative to the WVFMP.
- A 300-foot-wide non-shaded fuel break would be created on the ridgeline between Strawberry and Claremont canyons (the WVFMP includes a 126-foot-wide non-shaded fuel break that extends from Frowning Ridge to Claremont Canyon).
- Water tanks would be installed on Grizzly Peak Boulevard.
- An Alameda whipsnake preserve would be created on the upper south facing slopes of Strawberry Canyon.
- Fire roads throughout both Strawberry and Claremont canyons would be widened and graded to accommodate the Type 3 fire engines purchased.

Consistency with Plan Objectives

Alternative A includes implementation of various vegetation treatments on 400-500 acres of the Hill Campus to reduce wildfire risk: removing exotic trees; thinning vegetation; establishing fuel breaks along ridgelines and roads and around UC Berkeley facilities; and maintaining vegetation clearances along evacuation routes and power lines. Alternative A would reduce wildfire risk but not as effectively as the WVFMP, in part because the treatments proposed in locations that are high-fire risk, especially along evacuation routes, would comparatively do less to adequately reduce wildfire risks. As shown on Figure 11 in the WVFMP (refer to Appendix A), predicted flame lengths along the majority of the Upper Jordan Fire Trail are 11-20 feet or 20 feet or more when wind speeds are 20 miles per hour (mph). With 40 mph winds, predicted flame lengths along the Upper Jordan Fire Trail increase to 20 feet or more for substantial portions of its length (Figure 15 in Appendix A). Alternative A would establish 20-foot-wide fuel breaks along both sides of paved and unpaved roadways in the Plan Area, whereas evacuation support treatments under the WVFMP would be implemented within 100-200 feet on either side of evacuation routes in the Plan Area. The 20-foot-wide fuel breaks along roadways proposed under Alternative A would not prevent fire spread as effectively as the larger area of vegetation removed in evacuation support treatments under the WVFMP, particularly along the Upper Jordan Fire Trail where predicted flame lengths are high.

In comparison to the 20-foot-wide roadside fuel breaks proposed under Alternative A, the WVFMP better facilitates backfiring techniques and fire retardant drops during a wildfire in the evacuation support treatment areas because there would be larger areas of low fuel loads and reduced tree canopy (i.e., up to 200 feet on either side of evacuation routes). Also, the 200-foot-wide evacuation support treatments proposed under the WVFMP are important because, in steep areas of the Plan Area (e.g., along portions of the Upper Jordan Fire Trail), there is currently no other access to support fire suppression efforts and no other breaks in vegetation to help prevent a fire that is traveling downslope from reaching LBNL and the UC Botanical Garden, both highly valued assets. Sufficient wildfire risk reduction in these steep areas is critical and the WVFMP would provide the tools to achieve this more so than Alternative A.

Alternative A would remove hazard trees with the potential to fall and block the following paved evacuation routes: Grizzly Peak Boulevard, Claremont Avenue, and Centennial Drive, and would implement roadside fuel breaks within 20 feet of each side of paved and unpaved roads, whereas the WVFMP would remove hazard within 200 feet of each side of all paved and unpaved evacuation routes in the Plan Area. Under Alternative A, hazard trees would remain in place along unpaved evacuation routes, such as the Jordan Fire Trail; retaining these large trees would present a hazard if any fell and blocked access during a wildfire. The increased width of cleared vegetation and hazard tree removal on paved and unpaved evacuation routes as proposed under the WVFMP would provide additional life safety, reduced wildfire risks, and improved associated emergency access for evacuation and fire suppression during a wildfire.

In addition, because chipping/mastication would not be used to dispose of biomass under Alternative A, pile burning would substantially increase in frequency and extent relative to the WVFMP. This element of Alternative A would increase fire risk in the Plan Area due to the presence of extensive piles of dry fuel and the increased risk of accidental wildfire ignition or escape during frequent pile burning.

Moreover, the locations of the treatments specified in the WVFMP were carefully selected and prioritized using fuel modeling, consideration of vegetation management that has occurred in close proximity to the Plan Area, in coordination with a CAL FIRE forester, and were reviewed for effectiveness by CAL FIRE in order to provide a grant to UC Berkeley. Alternative A is not based on the same level of assessment of the Plan Area, which is reflected in the relatively generalized treatments described under Alternative A. For example, there are areas of conifers that have been identified for removal as a part of the Frowning FHR Project due to their likelihood of torching that are not included in Alternative A, and there are areas where conifer removal is proposed under Alternative A where the chance of torching is actually low (refer to Figure 11 in Appendix A and Map 5 in Appendix I); there are several areas where shaded fuel breaks are proposed by Alternative A that have been identified as having low predicted flame lengths (see Figure 11 in Appendix A and Map 7 in Appendix I), are already treated annually by UC Berkeley (see Figure 2 in Appendix A and Map 7 in Appendix I), or are adjacent to areas that have already been treated by other agencies (e.g., EBRPD and EBMUD) to a degree that make the locations proposed by Alternative A not a priority. As stated in the CAL FIRE grant contract: "the location and scale of the project is appropriate to achieve the goals, objectives and outcomes. The project treatments are located near strategic roadsides and fire trails, as well as in areas of predicted fire behavior where flame lengths are expected to exceed 8 feet and have high crown fire/torching potential. FlamMap simulations were used to target and justify treatment areas. The scale of the project is large enough, and treatments are located specific areas, to be successful in modifying fire containment and control strategies to reduce fire size and property damage. The width and type of treatment along roads is appropriate in order to achieve a reasonable level of safety during emergency access and evacuation." Although Alternative A would reduce the risk of wildfire in the long-term, it would not be as effective as the WVFMP in this regard. Therefore, Alternative A would attain the primary objective of substantially reducing risks to life, property and natural resources as well as the objectives to minimize GHG emissions and enhance evacuation routes and access for emergency fire suppression activities, but not to the same degree as the WVFMP.

Because Alternative A would treat 400-500 acres of vegetation aimed at reducing wildfire risk, including treatments to covert eucalyptus and conifer plantations to native vegetation in several locations in the Plan Area, Alternative A would increase the pace and scale of vegetation treatment activities and reduce highly flammable invasive plant species. Alternative A would be consistent with these objectives of the WVFMP and achieve them to a similar degree as the WVFMP.

Alternative A includes site-specific treatment areas for each management prescription and does not include flexibility to design and implement later treatment activities in various locations. Therefore, Alternative A would not achieve objectives that call for providing a variety of treatment types and activities that may be selected based on effectiveness and site-specific factors and implementation of an adaptive management framework to promote the long-term effectiveness of vegetation management. Alternative A prescribes ongoing maintenance activities at varying intervals and as often as every year in some cases. In addition, Alternative A includes the installation of additional water tanks and the purchase of two fire trucks that would need to be used by local fire departments, not exclusively on UC Berkeley property. These non-vegetation management components of Alternative A would be costly (a small wildland fire truck would cost in the $150,000 range and larger ones range to $300,000 and higher) and therefore limit the extent of initial vegetation treatment that could occur because there would be less funding available to implement vegetation treatments. Because less initial vegetation treatment would be possible relative to the WVFMP, Alternative A would not maximize the long-term effectiveness of initial vegetation treatments, and therefore, would not be consistent with this objective of the WVFMP.

Feasibility

Many of the management prescriptions proposed under Alternative A are substantially similar to vegetation treatments already occurring within the Plan Area or to those proposed in the WVFMP and would therefore be feasible to implement. Treatments proposed under Alternative A that are similar to ongoing or WVFMP proposed treatments include fuel reduction around structures and along roads and evacuation routes, removal of highly flammable invasive vegetation, such as eucalyptus trees favoring fire-resistant native vegetation, and implementation of fuel breaks. However, there would be significant practical challenges related to biomass disposal under Alternative A. For example, the number of burn piles required to dispose of the large quantities of biomass created would require several burn days and large crews, which would be challenging operationally (e.g., getting the necessary approval from the Bay Area Air Quality Management District [BAAQMD] prior to burning, tracking permissible burn days, and hiring larger crews to conduct the frequent burns) and could extend treatment durations. Also, pile burning is inconsistent with the university's Zero Waste Policy. UC Berkeley's Zero Waste Goal is to achieve 90 percent diversion of municipal solid waste by 2020. After fiscal year 2021/2022, the University will no longer accept combustion as a form of waste diversion in meeting Zero Waste goals and thus, burning large quantities of biomass would obstruct the attainment of this goal, thereby reducing the feasibility of this disposition method in the future.

Under Alternative A, there are areas on LBNL-managed land proposed for treatment. Similar to PG&E's responsibility to manage vegetation on lands under its powerlines and poles, LBNL is responsible for managing vegetation on land inside and surrounding its property in the Hill Campus pursuant to a 1996 Letter of Cooperation. Therefore, it would not be feasible for UC Berkeley to implement treatments in these areas outside of the university's jurisdiction that are managed under an existing agreement with LBNL.

Infrastructure and equipment related components of Alternative A would also likely be technically feasible, but are not practical, nor do they involve any vegetation treatment and therefore do not achieve project objectives. Installing cameras on PG&E owned utilities and property would require coordination with PG&E and they would need to be integrated into PG&E's existing wildfire detection system. Moreover, UC Berkeley has previously evaluated installing a wildfire detection system and determined that the location most visible to the Hill Campus would be on EBRPD parklands, and therefore UC Berkeley would not have control over installation, maintenance, and monitoring of cameras. Installing water tanks on Grizzly Peak Boulevard and purchasing two fire trucks may also be feasible, although, this also would not be practical. Water tanks were installed along the Jordan Fire Trail in the 1980's; however, the water supply was considered suspect by the fire departments since it was not from a hydrant and there was concern over the tank water clogging drafting equipment. For these reasons, the water tanks were considered a hazard and removed by UC Berkeley. Installing water tanks again would likely result in the same concerns from the fire departments serving the Plan Area. Moreover, UC Berkeley does not have its own fire department or firefighting capabilities. It relies on response from Oakland Fire Department, Berkeley Fire Department, Moraga-Orinda Fire District, and CAL FIRE. Therefore, purchasing fire equipment such as fire trucks would be costly, would not necessarily be dedicated to the project area if owned by another fire department, and would not provide a direct benefit to wildfire response in the Hill Campus.

ENVIRONMENTAL ANALYSIS OF ALTERNATIVE A

Aesthetics

Under Alternative A, most of the same treatment activities as the WVFMP (with the exception of prescribed broadcast burning) would be implemented, which would result in the same types of temporary affects to aesthetics and visual resources. As with the WVFMP, the visual effects of implementing treatments would be short-term and temporary, lasting only the length of active implementation. However, the number of burn piles under Alternative A would substantially increase and could remain in place for long periods of time because of restrictions put in place by BAAQMD on the days the university would be allowed to implement a burn and challenges related to staffing enough crew to complete the pile burns quickly. The presence of burn piles would likely be visible to public viewers and would degrade visual character and quality of the Plan Area. Like the WVFMP, the long-term effects of most treatments types would also be visible, and could result in long-term or substantial degradation of a scenic vista or degrade the existing visual character and quality of a site. Alternative A would include a 300-foot-wide primarily non-shaded ridgeline fuel break, remove conifer plantations along ridgelines, and install new water tanks along Grizzly Peak Boulevard. These treatments could result in long-term substantial adverse visual changes in the landscape by removing large areas of highly visible ridgeline vegetation and installing contrasting, human-made elements in an otherwise natural environment. This would result in the same significant and unavoidable impact as the WVFMP. Because many of the treatments under the WVFMP and Alternative A would be along ridgetops and adjacent to roads where the public can see the treatments, but the number of burn piles would substantially increase under Alternative A, the effects to aesthetics and visual resources under Alternative A would be slightly *greater than* the WVFMP and the same significant and unavoidable impact would occur.

Air Quality

Like the WVFMP, Alternative A would result in similar emissions generating activities as the WVFMP, such as site preparation and equipment use. Although Alternative A would not conduct broadcast prescribed burns, substantially more pile burning would need to occur to dispose of biomass, which could result in the same significant and unavoidable impacts related to objectionable odors and the short-term exposure of people to concentrations of TACs. Other impacts related to diesel particulate matter, fugitive dust, and objectionable odors from diesel exhaust would likely be greater than the WVFMP, due to the substantial increase in piling burning which would likely require extended equipment operation in order to cut tree trunks into moveable pieces to create burn piles and increase in ignition equipment use, and modifications to existing unpaved roads. Overall, the air quality effects of the Alternative A would be slightly *greater than* the WVFMP, and the same significant and unavoidable impact would occur.

Archaeological, Historical, and Tribal Cultural Resources

Similar to the WVFMP, Alternative A would implement ground disturbing activities that could disturb human remains, if present in a treatment area. Some of the ground disturbance under Alternative A would likely be more intense than under the WVFMP, because the non-shaded fuel would be more than twice as wide under Alternative A than under the WVFMP and from the installation of water tanks and modifications to existing unpaved roads included under Alternative A. As with the WVFMP, compliance with California Health and Safety Code Sections 7050.5 and 7052 and PRC Section 5097 would minimize the disturbance of any human remains and require the appropriate treatment of remains that are discovered under Alternative A. Similar to the WVFMP, unknown unique archaeological resources or subsurface historical resources also could be inadvertently discovered during ground disturbing treatment activities under Alternative A, and standard measures would be implemented to minimize and avoid damage to any discovered resources. However, the substantial pile burning anticipated under Alternative A would result in more frequent and geographically extensive areas of soil heating from the burn piles, which can adversely affect cultural resources if present. Therefore, impacts to archaeological, historical, and tribal cultural resources would be *greater than* the WVFMP.

Biological Resources

Like the WVFMP, all types of vegetation treatment activities under Alternative A could affect special-status plant and animal species, result in the degradation of riparian habitat or other sensitive natural communities, adversely affect wetlands, and interfere with wildlife movement corridors or impede the use of nurseries. In addition, the installation of water tanks and modifications to existing fire roads under Alternative A, including greater ground disturbance associated with these activities and a larger non-shaded fuel break, could also adversely affect biological resources. No prescribed broadcast burning would be conducted, so impacts associated with this treatment activity would be avoided; however impacts related to pile burning would increase under Alternative A due to the increased burn piles that would be created to dispose of biomass. An Alameda whipsnake preserve would be created under Alternative A that would preserve 167 acres of treated areas in the Hill Campus to benefit this special-status species. The Identified

Treatment Projects included in the WVFMP were sited to avoid and maintain large areas of high quality Alameda whipsnake habitat, using USFWS Alameda whipsnake habitat data maps, and beneficial effects in the form of improved habitat conditions and reduced severity of wildfire are anticipated. Although beneficial impacts are not analyzed under CEQA, because the WVFMP would be more effective in reducing wildfire risk, there would likely be a greater long-term benefit to special-status plants and wildlife due to the reduced frequency and severity of wildfire than under Alternative A. Impacts to biological resources under Alternative A would be *similar to* the WVFMP, although the WVFMP could have greater benefits to some species.

Geology and Soils

Like the WVFMP, Alternative A would disturb soils and reduce vegetative cover, which has the potential to increase the rates of erosion, disturb topsoil, and destabilize slopes increasing the risk of landslides. Some of the ground disturbance under Alternative A would be more intense than under the WVFMP, because the non-shaded fuel would be more than twice as wide under Alternative A than under the WVFMP and from the installation of water tanks and modifications to existing unpaved roads included under Alternative A. Although no broadcast burning would occur, the numerous burn piles required to dispose of biomass would create areas of bare soil when the biomass is consumed, thereby potentially increasing the rates of erosion and movement of ash. However, compliance with 2020 LRDP EIR Continuing Best Practices would minimize these impacts. Because some areas of ground disturbance would be more extensive than under the WVFMP, and because Alternative A would expose more bare soil and increase erosion due to frequent and extensive pile burning, impacts related to geology and soils would be slightly *greater than* the WVFMP.

Greenhouse Gas Emissions and Climate Change

Alternative A would include many of the same short-term GHG emissions-generating activities and sources as the WVFMP, such as from equipment and vehicle use. Although there would be no broadcast prescribed burning conducted under Alternative A, pile burning would substantially increase as a method to dispose of biomass. Alternative A would also likely require extended equipment operation relative to the WVFMP in order to cut tree trunks into moveable pieces and remove tree branches to create burn piles. Thus, short-term GHG emissions under Alternative A would likely be similar and potentially higher than under the WVFMP due to the frequency at which pile burning would need to be conducted under Alternative A. Like the WVFMP, treatment activities under Alternative A would reduce wildfire risk in the Hill Campus, which would be expected to reduce future GHG emissions from wildfires and increase carbon sequestration in the long term. This would be consistent with applicable plans, policies, and regulations adopted for the purpose of reducing the emissions of GHGs. However, because the treatments proposed in locations that are high-fire risk, especially along evacuation routes, would not be adequate in reducing the risks associated with wildfire spread under Alternative A, and the treatments proposed in the WVFMP are strategically placed to support fire suppression and to minimize fire ignitions and spread, Alternative A would not reduce wildfire risk in the Plan Area to the same degree as the WVFMP. Because of the increased frequency of pile burning and that potential long-term GHG emissions reduction and carbon sequestration benefits would likely be reduced relative to the WVFMP, the GHG impact under Alternative A would be potentially *greater than* the WVFMP.

Hazards and Hazardous Materials

Like the WVFMP, Alternative A would include the transportation, use, storage, and disposal of various hazardous substances, including fuels and oils to operate vehicles and equipment and herbicides. Use of these substances could result in risks related to human exposure if any leaks or spills were to occur or in the case of herbicides, when applied in areas in close proximity to the public. Although no broadcast burning would occur under Alternative A, because the frequency and extent of pile burning under Alternative A would be much higher than under the WVFMP, there would be a substantial increase in the use of ignition devices such as drip torches, which would result in greater risks of leaks or spills of fuels. Alternative A would also include compliance with applicable laws and regulations that reduce the risks associated with the use of hazardous materials, including herbicides. Because Alternative A would use similar equipment and hazardous substances as the WVFMP, but substantially increase the frequency of use of ignition devices, impacts related to hazards and hazardous materials would be slightly *greater than* the WVFMP.

Hydrology and Water Quality

Manual and mechanical treatment activities and herbicide use under Alternative A would have similar potential to violate water quality standards or waste discharge requirements, substantially degrade surface or ground water quality, or conflict with or obstruct the implementation of a water quality control plan as the WVFMP. However, ground disturbance and associated erosion and sedimentation under Alternative A would likely be more extensive than under the WVFMP, because the non-shaded fuel would be more than twice as wide under Alternative A than under the WVFMP and from the installation of water tanks and modifications to existing unpaved roads included under Alternative A. These effects would be minimized through compliance with applicable laws and regulations. Unlike the WVFMP, Alternative A would not conduct broadcast burns. However, because pile burning would substantially increase under Alternative A, potential impacts associated with ash and other sediment entering watercourses from burn piles would increase. Because areas of ground disturbance would be more extensive than under the WVFMP, and pile burning would increase in frequency and extent, impacts to hydrology and water quality would be *greater than* the WVFMP.

Noise

Like the WVFMP, short-term noise from the use of manual equipment (i.e., chainsaws), mechanical equipment, and water tenders under Alternative A would occur, and local noise standards could be exceeded when conducted in close proximity to residential land uses. Because local noise standards could be exceeded, Alternative A would result in the same significant and unavoidable impact as the WVFMP. Alternative A would likely require extended equipment operations relative to the WVFMP in order to cut tree trunks into moveable pieces and remove tree branches to create burn piles. Thus the length of time that noise standards would be exceeded (e.g., from chainsaw use and during pile burning) would likely increase under Alternative A. Therefore, impacts related to noise and vibration would be slightly *greater than* the WVFMP and the same significant and unavoidable impact would occur.

Recreation

Similar to the WVFMP, during the implementation of vegetation treatments under Alternative A, impacts to recreation could occur as result of temporary access restrictions when equipment use or staging occurs within or immediately adjacent to public trails, or as a result of nuisance impacts, such as noise, dust/smoke emissions, or degradation of views from equipment. Unlike the WVFMP, Alternative A would not conduct broadcast burns. However, Alternative A would likely require extended equipment operations relative to the WVFMP in order to cut tree trunks into moveable pieces and remove tree branches to create burn piles. In addition, burning would be more frequent than under the WVFMP because of the extensive use of pile burning to remove biomass. Therefore, the length of time and frequency at which recreationists could be affected by equipment noise, smoke emissions, and access restrictions would increase and impacts to recreation under Alternative A would be *greater than* the WVFMP.

Wildfire

Like the WVFMP, Alternative A would operate machinery and use vehicles within vegetated areas, which have the potential to ignite surrounding vegetation. Unlike the WVFMP, no broadcast burns would be conducted; however, pile burning would substantially increase under Alternative A. Because of the numerous piles that would be required to dispose of biomass, several burning operations would need to occur, which create an elevated risk of accidental ignition and escape. This element of Alternative A would also increase fire risk in the Plan Area due to the presence of extensive piles of dry fuel, which are a wildfire hazard until burned.

Over the long term, the risks associated with wildfire, including post-fire landslides or flooding, would be greater under Alternative A than under the WVFMP because Alternative A would be less effective at reducing wildfire risks in the Plan Area. As further described under “Consistency with Plan Objectives” above, treatments under the WVFMP were sited in strategic locations that optimize fire suppression and containment efforts and minimize ignition potential, and take into consideration fuel modeling outputs, input from a professional forester, adjacent vegetation treatments that have been implemented by other jurisdictions, and were reviewed for effectiveness by CAL FIRE. Under Alternative A, substantially less vegetation removal would occur along evacuation routes and in areas determined to have high fire risks in the Plan Area. Therefore, impacts related to wildfire under Alternative A would be *greater than* the WVFMP.

6.3.3 Alternative B: Reduced Treatment Alternative

ALTERNATIVE DESCRIPTION

Alternative B is based on a NOP comment letter that was received from the Hills Conservation Network (HCN) that proposes an alternative to the WVFMP. Alternative B also addresses comments on the NOP that advocate for prohibiting the use of herbicides at UC Berkeley.

Alternative B includes the implementation of evacuation support treatments, shaded fuel breaks, and fire hazard reduction treatments within a zone of 100-200 feet from roadways and structures. All three of these treatment types would involve the removal of understory/ground fuels and ladder fuels, tree pruning and removal of overhanging branches, and select tree removal of trees less than 18 inches in diameter. Alternative B prioritizes fuel reduction treatments in the following order:

1. reduce fine fuel, cured fuel, and fuel in proximity to human activity;
2. reduce fuels that spread fire and increase the intensity of fire (i.e., ground fuels); and
3. create fire resistant conditions by lowering temperatures and discouraging the succession of flammable fine fuels through shading, increasing moisture, reducing wind speed, and avoiding the creation of more fuel by leaving chips or other biomass on treatment sites.

Alternative B emphasizes maintaining the existing overstory/tree canopy and prohibits the use of herbicides and planting of any new vegetation. Only manual treatment activities (i.e., loppers, hand-operated power tools such as chainsaws) would be used to implement the three treatment types, and all biomass would be hauled offsite.

Alternative B proposes some of same vegetation treatment types as the WVFMP (exceptions include non-shaded fuel breaks and temporary refuge areas), and would use only one of the vegetation treatment activities included in the WVFMP (i.e., manual treatments). Treatments under Alternative B would be expected to occur throughout the same Plan Area shown on Figure 2-1 in Chapter 2, “Project Description.”

This alternative would reduce short-term impacts related to air quality and noise that could occur during prescribed burning and treatments using mechanical equipment as well as long-term aesthetic impacts associated with non-shaded fuel breaks and temporary refuge areas, although these impacts would not be fully avoided due to the use of hand equipment such as chainsaws, and long-term visual changes in landscape due to vegetation treatments. Haul trips would be increased as a result of complete biomass removal, and limiting treatment activities to manual methods could result in the need for more staff to complete the treatments, a longer duration to implement treatments, increased maintenance needs, and thus reduced overall effectiveness.

In summary, the key differences between Alternative B and the WVFMP, which are considered in the environmental analysis below, are:

- There would be no non-shaded fuel breaks or temporary refuge areas created.
- No mechanical treatments, herbicide application, managed herbivory or prescribed burning would be conducted.
- All biomass would be hauled offsite for disposal.

Consistency with Plan Objectives

Alternative B would implement evacuation route treatments, shaded fuel breaks, and fire hazard reduction treatments by thinning vegetation and removing ground and ladder fuels throughout the Hill Campus to reduce the risk of wildfire. However, the use of only manual methods under Alternative B would reduce the effectiveness of this alternative in reducing wildfire risk for the reasons described below. Treatments under Alternative B would take substantially longer to implement than the WVFMP because other treatment methods, such as using mechanical equipment, remove vegetation more quickly and efficiently than manual methods. Therefore, substantial wildfire risk reduction would take much longer to achieve under Alternative B. In addition, treatments would be more difficult to maintain without the use of herbicides and managed herbivory because of rapid regrowth of vegetative fuels in treated areas and substantially more follow-up hand labor relative to the WVFMP. Furthermore, no trees over 18 inches in diameter would be removed. Therefore, large hazardous trees with risks of falling and blocking evacuation routes would remain in the Plan Area, potentially inhibiting emergency evacuation and fire suppression during a wildfire.

As described in Section 6.3.2, “Alternative A: The McBride Plan Alternative,” the locations of the treatments specified in the WVFMP were carefully selected and prioritized using fuel modeling, consideration of vegetation management that has occurred in close proximity to the Plan Area, in coordination with a professional CAL FIRE forester, and were reviewed for effectiveness by CAL FIRE in order to provide a grant to UC Berkeley. Alternative B is not based on the same level of assessment of the Plan Area, which is reflected in the lack of specificity regarding locations of treatments described under Alternative B. CAL FIRE indicated in the grant contract that the WVFMP is appropriate in location and scale to achieve the objectives of the Plan.

Although Alternative B would reduce the risk of wildfire in the long-term, it would not be as effective as the WVFMP at reducing wildfire risks. Therefore, Alternative B would attain the primary objective of substantially reducing risks to life, property, and natural resources as well as the objectives to minimize GHG emissions and enhance evacuation routes and access for emergency fire suppression activities, but not to the same degree as the WVFMP.

Because Alternative B would treat vegetation aimed at reducing wildfire risk, including the implementation of evacuation support treatments, shaded fuel breaks, and fire hazard reduction treatments, Alternative B would increase the scale of vegetation treatment activities and reduce highly flammable invasive plant species. However, because Alternative B would be implemented entirely using manual treatment activities, which would take more time to achieve wildfire risk reduction relative to the WVFMP, it would not increase the pace of implementation. This alternative would not be consistent with this objective to the same degree as the WVFMP.

Alternative B would not attain objectives that call for a variety of vegetation treatment activities that could be selected based on effectiveness and other factors because it only includes manual treatment, nor does it include any kind of an adaptive management framework to promote the long-term effectiveness of wildfire risk reduction. In addition, because only manual treatments would occur, Alternative B would not attain the objective to maximize the long-term effectiveness of initial vegetation treatments to responsibly use the grant funding that is available.

Feasibility

Because Alternative B would treat the same area as the WVFMP using similar but substantially fewer vegetation treatment types and activities, this alternative is potentially feasible. However, implementation of evacuation route treatments, shaded fuel breaks, and fire hazard reduction treatments under Alternative B would occur using manual equipment only. Therefore, treatments would take substantially longer to implement and require larger crews, and would require frequent follow-up treatments to maintain treated areas and prevent regrowth of removed vegetation since there would be no use of herbicides or managed herbivory. This would present operational challenges related to maintaining initial treatments.

ENVIRONMENTAL ANALYSIS OF ALTERNATIVE B

Aesthetics

Unlike the WVFMP, only manual treatment activities would occur under Alternative B. Thus, the extent of short-term and temporary effects on aesthetics and visual resources would be less than the WVFMP because there would not be large equipment visible in treatment areas or any smoke from prescribed broadcast burns or pile burning. Like the WVFMP, Alternative B would implement evacuation support treatments, shaded fuel breaks, and fire hazard reduction treatments. However, Alternative B would maintain the existing overstory in the Plan Area and would not create non-shaded fuel breaks or temporary refuge areas. Therefore, although long-term impacts would be reduced under Alternative B, it would result in the same significant and unavoidable affect as the WVFMP from long-term visual changes to the landscape. Because Alternative B would use manual equipment only and not create any fuel breaks or temporary refuge areas, the effects to aesthetics and visual resources under Alternative B would be *less than* the WVFMP, although the same significant and unavoidable impact would occur.

Air Quality

Similar to the WVFMP, temporary and short-term air quality emissions would occur from site preparation and use of equipment and vehicles under Alternative B. Although emissions associated with hauling biomass offsite and increased use of chainsaws would likely occur, because no prescribed burning would be conducted, Alternative B would avoid the significant and unavoidable impacts related to exposing people to toxic air contaminants and odors from prescribed burning. Therefore, effects to air quality under Alternative B would be *less than* the WVFMP.

Archaeological, Historical, and Tribal Cultural Resources

Similar to the WVFMP, Alternative A would implement ground disturbing activities that could disturb human remains, unknown unique archaeological resources, or subsurface historical resources if present in a treatment area. The potential to uncover any of these protected cultural resources would be less under Alternative B compared to the WVFMP because only manual treatment activities would occur; therefore, ground disturbance would be substantially less. As with the WVFMP, compliance with California Health and Safety Code Sections 7050.5 and 7052 and PRC Section 5097 would minimize the disturbance of any human remains and require the appropriate treatment of any remains that are discovered under Alternative B. In addition, standard protection measures would be implemented to minimize and avoid damage to any discovered archaeological or historic resources. Because only manual treatments would occur under Alternative B, potential impacts to archaeological, historical, and tribal cultural resources would be *less than* the WVFMP.

Biological Resources

Like the WVFMP, manual treatment activities under Alternative B could affect special-status plant and animal species, result in the degradation of riparian habitat or other sensitive natural communities, adversely affect wetlands, and interfere with wildlife movement corridors or impede the use of nurseries as a result of ground disturbance, vegetation removal, noise from equipment and personnel, and potential trampling/crushing of special-status plants, sensitive natural communities, or wetland vegetation by workers. However, no mechanical vegetation treatments, or prescribed burning would occur under Alternative B, which have a higher likelihood of adversely affecting biological resources than manual treatments because mechanical treatments typically result in more ground disturbance than manual treatments and the removal of vegetation using mechanical treatments and prescribed burning is less precise in comparison to manual treatments. In addition, herbicides would not be used, so impacts from this treatment activity would be avoided. For these reasons, impacts to biological resources would be *less than* the WVFMP, although the WVFMP would likely have greater benefits to some species.

Geology and Soils

Like the WVFMP, Alternative B would disturb soils and reduce vegetative cover, which has the potential to increase the rates of erosion, disturb topsoil, and destabilize slopes increasing the risk of landslides. However, compliance with existing campus best practices as described in the 2020 LRDP EIR would avoid and minimize these impacts. Because Alternative B would only use manual treatment activities within the Plan Area, which would require substantially less ground disturbance and vegetative cover would remain, impacts related to geology and soils would be *less than* the WVFMP.

Greenhouse Gas Emissions and Climate Change

Alternative B would include fewer GHG emissions-generating activities than the WVFMP. Use of hand-operated power tools (e.g., chainsaws) during manual treatments would generate GHG emissions, but prescribed burning and mechanical equipment use, which are more emissions-intensive, would not occur. However, haul trips to dispose of all biomass offsite would substantially increase under Alternative B. Therefore, while, short-term GHG emissions associated with mechanical treatment activities and prescribed burning would be avoided, higher GHG emissions from truck trips would occur under Alternative B. Like the WVFMP, treatment activities under Alternative B would reduce wildfire risk in the Hill Campus, which would be expected to reduce future GHG emissions from wildfires and increase carbon sequestration in the long term. This would be consistent with applicable plans, policies, and regulations adopted for the purpose of reducing the emissions of GHGs. However, because of the extended duration of time required to achieve substantial wildfire risk reduction as a result of using only manual treatment methods and likely rapid regrowth of vegetative fuels, it would not reduce vegetation and associated wildfire risk to the same extent as the WVFMP and therefore could result in substantially less potential long-term GHG emission reduction and carbon sequestration benefits. Even though short-term GHG emissions reduction would be less under Alternative B, because potential long-term GHG emissions reduction and carbon sequestration benefits would be reduced, the GHG impact would be potentially *greater than* the WVFMP.

Hazards and Hazardous Materials

Like the WVFMP, Alternative B would include the transportation, use, storage, and disposal of various hazardous substances, including fuels and oils to operate vehicles and handheld equipment such as chainsaws. Use of these substances could result in risks related to human exposure if any leaks or spills were to occur. Alternative B would also include compliance with applicable laws and regulations that reduce the risks associated with the use of hazardous materials. Under Alternative B, there would be no use of heavy-duty mechanical equipment. Therefore, the potential for leaks and accidental spills related to the operation of vehicles and equipment would be reduced, but not avoided under Alternative B because vehicles and handheld equipment (e.g., chainsaws) would be used. In addition, herbicide use would be prohibited under Alternative B. Although herbicides would be used according to applicable laws and regulations and according to label guidance under the WVFMP, because they would not be used at all under Alternative B, potential impacts associated with this treatment activity would be avoided. Therefore, the transportation, use, storage, and disposal of hazardous materials would be reduced under Alternative B and impacts related to hazards and hazardous materials would be *less than* the WVFMP.

Hydrology and Water Quality

Like the WVFMP, Alternative B would conduct manual vegetation treatments, which could result in similar impacts to water quality as the WVFMP. Unlike the WVFMP, Alternative B would not conduct any prescribed burns or use mechanical treatment activities, herbicides, or prescribed herbivory to implement vegetation treatments. Therefore, potential impacts associated with ash, hazardous materials, and sediment from ground disturbance entering watercourses would be substantially reduced under Alternative B. Because Alternative B would only use manual treatment activities to implement vegetation treatments, impacts to hydrology and water quality would be *less than* the WVFMP.

Noise

Like the WVFMP, short-term noise from the use of manual equipment (i.e., chainsaws) under Alternative B would occur, and local noise standards could be exceeded when conducted in close proximity to residential land uses. Because local noise standards could be exceeded, Alternative B would result in the same significant and unavoidable impact as the WVFMP. However, no heavy-duty mechanical equipment would be used and no prescribed burning would be conducted, thus, related short-term noise impacts would be avoided relative to the WVFMP. Therefore, impacts related to noise and vibration would be slightly *less than* the WVFMP, but the same significant and unavoidable impact as a result of chainsaw use near residences would occur.

Recreation

Unlike the WVFMP, there would be no mechanical treatment activities, herbicide use, or prescribed burning under Alternative B. Accordingly, access restrictions during the implementation of vegetation treatments under Alternative B would be reduced. Furthermore, nuisance impacts such as noise, dust/smoke emissions, or degradation of views from equipment would also be less under Alternative B due to the lack of mechanical treatment activities and prescribed burning. Because Alternative B would only use manual treatment activities to implement vegetation treatments, impacts to recreation would be *less than* the WVFMP.

Wildfire

Unlike the WVFMP, there would be no mechanical treatment activities, prescribed broadcast burning, or pile burning to dispose of biomass under Alternative B. Accordingly, there would be fewer activities occurring that have the potential to ignite surrounding vegetation relative to the WVFMP and the exacerbation of fire risk during treatments would be reduced under Alternative B. Over the long term, the risks associated with wildfire would be greater under

Alternative B than under the WVFMP because it would not reduce the risk of wildfire as effectively as the WVFMP. Treatments under Alternative B would take substantially longer to implement than the WVFMP because other treatment methods, such as using mechanical equipment, remove vegetation more quickly and efficiently than manual methods. Therefore, significant wildfire risk reduction would take much longer to achieve under Alternative B and greater amounts of wildfire fuels would remain in the Plan Area for extended periods of time. In addition, treatments would be more difficult to maintain without the use of herbicides and managed herbivory, resulting in rapid regrowth of vegetative fuels in treated areas and substantially more follow-up hand labor relative to the WVFMP. Furthermore, no trees over 18 inches in diameter would be removed. Therefore, large hazardous trees with risks of falling and blocking evacuation routes would remain in the Plan Area, potentially inhibiting emergency evacuation and fire suppression during a wildfire. For these reasons, impacts related to wildfire would be *greater than* the WVFMP.

6.4 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

CEQA calls for the identification of an environmentally superior alternative in an EIR but gives no definition for the term (State CEQA Guidelines Section 15126.6(e)). For the purposes of this EIR, the environmentally superior alternative is the alternative that would result in the fewest potentially significant impacts while achieving most of the basic program objectives to the greatest extent. Table 6-2 presents a comparison of the environmental effects of each alternative relative to the WVFMP, including identification of whether an alternative would avoid any significant and unavoidable impact of the WVFMP.

With each alternative, there would be environmental tradeoffs; that is, impacts to certain resource areas from an alternative would increase while others would decrease relative to the WVFMP. The No Project Alternative and Alternative B would avoid two significant and unavoidable impacts of the WVFMP, and all alternatives would result in greater impacts than the WVFMP for some resource areas. The No Project Alternative and Alternative B would avoid significant and unavoidable impacts related to air quality because they would not generate smoke and associated air pollutants from prescribed burning, but the same significant and unavoidable impacts to aesthetics, cultural resources, and noise as the WVFMP would occur under these alternatives. Alternative A would not avoid or lessen any of the significant impacts of the WVFMP. In summary, none of the alternatives would avoid all of the significant and unavoidable impacts of the WVFMP, and no alternative would result in a new significant impact that would not also occur under the WVFMP.

The WVFMP would attain all of the basic Plan objectives, but would result in potentially significant impacts and require the application of mitigation to reduce some, but not all, of the significant impacts to less than significant levels. Alternative B would be the environmentally superior alternative because, although not all of the significant and unavoidable impacts of the WVFMP would be completely avoided, the use of only manual treatment activities to implement vegetation treatments would reduce impacts to almost every environmental resource areas and avoid significant and unavoidable impacts to air quality from prescribed burning. Significant impacts related to noise during treatments would be less under Alternative B relative to the other alternatives because no mechanical treatment activities or prescribed burning would occur. In addition, significant long-term aesthetic impacts would also be less under Alternative B relative to the other alternatives because treatments would take substantially longer to implement and regrowth would occur more rapidly without herbicide use to eliminate undesirable vegetation. However, impacts related to GHG emissions and wildfire would be greater under all of the alternatives, including Alternative B, relative to the WVFMP.

Table 6-2 Summary of Environmental Effects of the Alternatives Relative to the WVFMP

Environmental Topic	Proposed WVFMP	No Project Alternative	Alternative A: McBride Plan Alternative	Alternative B: Reduced Treatment Alternative
Aesthetics	SU	less (same significant and unavoidable impact would occur)	slightly greater	less (same significant and unavoidable impact would occur)
Air Quality	SU	less (avoids the 2 significant and unavoidable impacts)	slightly greater	less (avoids the 2 significant and unavoidable impacts)
Archaeological, Historical, and Tribal Cultural Resources	SU	less (same significant and unavoidable impact would occur)	greater	less (same significant and unavoidable impact would occur)
Biological Resources	LTSM	less	similar	less
Geology and Soils	LTS	slightly less	slightly greater	less
Greenhouse Gas Emissions and Climate Change	LTS	potentially greater	potentially greater	potentially greater
Hazards and Hazardous Materials	LTS	slightly less	slightly greater	less
Hydrology and Water Quality	LTSM	less	greater	less
Noise	SU	slightly less (same significant and unavoidable impact would occur)	slightly greater	slightly less (same significant and unavoidable impact would occur)
Recreation	LTS	less	greater	less
Wildfire	LTS	greater	greater	greater

An important consideration in the comparison of alternatives is the degree to which each alternative would meet the primary objective of the Plan: to substantially reduce risk to life, property, and natural resources on the UC Berkeley campus and in the greater East Bay region by managing the amount and continuity of vegetation in the Hill Campus that increases wildland fire hazards. All of the alternatives would reduce wildfire risks through vegetation management; however, none would do so as effectively as the WVFMP.

The No Project Alternative would not implement fire hazard reduction treatments or fuel breaks, which are effective in containing a wildfire and reducing its spread. Therefore, No Project Alternative would not be as effective at reducing wildfire risk as the WVFMP, which includes both treatment types.

The evacuation support treatments under Alternative A would not reduce wildfire hazards and associated risks in some high fire hazard areas of the Plan Area as effectively as the WVFMP because the roadside fuel breaks are too small, and treatments would not remove hazard trees along unpaved evacuation routes. Under the WVFMP, vegetation and hazard trees would be removed 100 to 200 feet on either side of all evacuation routes, including hazard tree removal along unpaved evacuation routes where fire risks are known to be high. Furthermore, Alternative A would require a substantial increase in the frequency and extent of pile burning to dispose of biomass in comparison to the WVFMP. The presence of extensive piles of dry fuel would increase fire risk in the Plan Area, and increased risk of accidental wildfire ignition and escape during the frequent pile burning that would also increase fire under Alternative A relative to the WVFMP.

Treatments under Alternative B would be implemented using only manual treatment methods, which would take substantially longer to implement than the WVFMP because other treatment methods, such as using mechanical equipment, remove vegetation more quickly and efficiently. Therefore, substantial wildfire risk reduction would take much longer to achieve under Alternative B. In addition, treatments would be more difficult to maintain without the use of herbicides and managed herbivory, resulting in more regrowth of vegetative fuels in treated areas. Furthermore, no trees over 18 inches in diameter would be removed under Alternative B, which would leave hazardous trees with risks of falling and blocking evacuation routes in the Plan Area, potentially inhibiting emergency evacuation and fire suppression during a wildfire. Moreover, the location and types of treatments specified in the WVFMP have been carefully reviewed for effectiveness by CAL FIRE in order to provide a grant to UC Berkeley. CAL FIRE indicated in the grant contract that the WVFMP is appropriate in location and scale to achieve the objectives of the Plan. Although all of the alternatives would reduce the risk of wildfire to a degree in the long-term, they would not be as effective as the WVFMP at reducing wildfire risks in the Plan Area.

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9 LIST OF ABBREVIATIONS

°C	Celsius
°F	degrees Fahrenheit
2020 LRDP	UC Berkeley 2020 Long Range Development Plan
AB	Assembly Bill
ACE	Affordable Clean Energy rule
ACFD	Alameda County Fire Department
APCO	Air Pollution Control Officer
ATCM	airborne toxic control measure
BAAQMD	Bay Area Air Quality Management District
BFD	Berkeley Fire Department
BIOS	Biogeographic Information and Observation System
Board	Board of Forestry and Fire Protection
CAA	Clean Air Act
CAAA	Clean Air Act Amendments of 1990
CAAQS	California Ambient Air Quality Standards
CAC	county agricultural commissioners
CAFE	corporate average fuel economy
CAL FIRE	California Department of Forestry and Fire Protection
Cal/OSHA	California Division of Occupational Safety and Health Administration
CALAND model	California Natural and Working Lands Carbon and Greenhouse Gas Model
CalEPA	California Environmental Protection Agency
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CARPA	California Air Response Planning Agency
CCAA	California Clean Air Act
CCCI	Condor Country Consulting, Inc.
CCI	California Climate Investments
CCR	California Code of Regulations
CCTS	Central California Taxonomic System
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CERCLA	Compensation, and Liability Act of 1980

CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CGS	California Geological Survey
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CNRA	California Natural Resources Agency
CO	carbon monoxide
CO_2	carbon dioxide
CPUC	California Public Utilities Commission
CRHR	California Register of Historic Resources
CRPR	California Rare Plant Rank
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationship
dB	decibels
diesel PM	diesel exhaust
DOT	U.S. Department of Transportation
DPR	Department of Pesticide Regulation
DTSC	California Department of Toxic Substances Control's
EBRPD	East Bay Regional Park District
ECA	Essential Connectivity Areas
EGU	electric generating units
EH&S	Environment, Health and Safety
EIR	Environmental Impact Report
EMFAC	Emission Factor
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EPM	Environmental Protection Measures
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FACA	Federal Advisory Committee Act
FB	fuel breaks
FEMA	Federal Emergency Management Agency
FHR	fire hazard reduction treatments

FHSZ	Fire Hazard Severity Zones
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
Forest Practice Act	Z'berg -Nejedly Forest Practice Act
FSSBER	Field Station for the Study of Behavior, Ecology, and Reproduction
FTA	Federal Transit Administration
GHG	greenhouse gas
HAP	hazardous air pollutants
HEF	Hills Emergency Forum
HMBP	Hazardous Materials Business Plans
HRI	heat rate improvement
HWCA	California Hazardous Waste Control Act
HWHF	Hazardous Waste Handling Facility
Hz	hertz
IARC	International Agency for Research and Cancer's
IPCC	Intergovernmental Panel on Climate Change
IPMC	Integrated Pest Management Committee
lb/day	pounds per day
LBNL	Lawrence Berkeley National Laboratory
LCFS	Low Carbon Fuel Standard
L_{dn}	day-night average sound level
L_{eq}	Equivalent Continuous Sound Level
L_{max}	Maximum Sound Level
LRDP	Long Range Development Plan
LUST	leaking underground storage tanks
MACT	Maximum Achievable Control Technology
MBTA	Migratory Bird Treaty Act
MLD	Most Likely Descendant
$MMTCO_2e$	million metric tons of carbon dioxide equivalent
MPH	miles per hour
MSRI	Math Science Research Institute
NAAQS	national ambient air quality standards
NAHC	Native American Heritage Commission
NHPA	National Historic Preservation Act
NHTSA	National Highway Traffic Safety Administration
NIOSH	National Institute for Occupational Safety and Health

NO	nitric oxide
NO_2	Nitrogen dioxide
NOA	naturally occurring asbestos
NOP	Notice of Preparation
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWIC	Northwest Information Center
OEHHA	Office of Environmental Health Hazard Assessment
OSCAR	Open Space Conservation and Recreation Element
OSHA	Occupational Safety and Health Administration
ozone	photochemical smog
PAH	polycyclic aromatic hydrocarbons
PCA	Pesticide Control Advisor
PEL	Permissible Exposure Limits
PG&E	Pacific Gas & Electric
Plan Area or Hill Campus	UC Berkeley Hill Campus
PM_{10}	respirable particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	fine particulate matter with an aerodynamic diameter of 2.5 microns or less
Porter-Cologne Act	Porter-Cologne Water Quality Control Act of 1970
PPE	personal protective equipment
ppm	parts per million
PRC	Public Resources Code
RCRA	Resource Conservation and Recovery Act
ROG	reactive organic gases
RPF	Registered Professional Forester
RWQCB	Regional Water Quality Control Board
SAFE Rule	Safer Affordable Fuel-Efficient Vehicles Rule
SARA	Superfund Amendments and Reauthorization Act
SB	Senate Bill
SBI	Swaim Biological Inc.
SFBAAB	San Francisco Bay Area Air Basin
SGC	Strategic Growth Council
SIP	State Implementation Plan

SMP	smoke management plan
SO_2	sulfur dioxide
SPL	sound pressure level
SPRP	Spill Prevention and Response Plan
SR	State Route
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	toxic air contaminants
TCR	tribal cultural resources
TMDL	total maximum daily load
tons/year	tons per year
TPQ	Threshold Planning Quantities
TRA	Temporary Refuge Area
U.S.	United States
UC Berkeley	University of California, Berkeley
UC Regents	Regents of the University of California
UCPD	University of California Police Department
UFP	ultrafine particulate matter
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VHFHSZ	Very High Fire Hazard Severity Zone
VMT	vehicle miles traveled
VOC	volatile organic compounds
WOE	weight-of-evidence
WPB	watercourse protection buffers
WPS	Worker Protection Standard
WQO	Water Quality Objectives
WUI	wildland-urban interface
WVFMP	Hill Campus Wildland Vegetative Fuel Management Plan
ZEV	zero-emission vehicle
$\mu g/m^3$	micrograms per cubic meter

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