Chapter 3 **Environmental Consequences**

3.1 Introduction

NEPA requires that environmental documents disclose the environmental impacts of a proposed federal action, reasonable alternatives to that action, and any adverse environmental effects that cannot be avoided should the Alexander Avenue/Danes Drive Intersection Improvement Project (proposed project) be implemented. This EA analyzes the environmental effects associated with four distinct alternatives: No Action Alternative (Alternative A); 16-Foot Catchment Alternative (Alternative B); 5-Foot Catchment Alternative (Alternative C); and 8-Foot Catchment Alternative (Alternative D) (Preferred Alternative). NEPA requires consideration of context, intensity, and duration of impacts; indirect impacts; cumulative impacts; and measures to mitigate impacts.

3.2 General Methodology

This EA assesses both direct impacts (an effect that is caused by an action and occurs at the same time and place) and indirect impacts (an effect that is caused by an action but is later in time or farther removed in distance, but still reasonably foreseeable). The analysis of environmental impacts considers the context, duration, intensity, and type of impact, as defined below.

3.2.1 Context

The context of the impact considers whether the impact would be local or regional. For the purposes of this analysis:

- ***Local impacts*** would generally be those that occur within the immediate vicinity of the proposed project.
- ***Regional impacts*** would be those that occur within the greater GGNRA Marin Headland area, at Fort Baker, or within surrounding areas.

3.2.2 Duration

The duration of the impact considers whether the impact would occur in the short term or the long term.

- ***Short-term*** impacts are temporary, transitional, or construction-related impacts associated with project activities.
- ***Long-term*** impacts last several years or more or would be permanent.

3.2.3 Intensity

Intensity is a measure of the severity of an impact. The intensity of the impact considers whether the effect would be negligible, minor, moderate, or major. Definitions of these impact intensities are as follows:

- ***Negligible*** impacts would not be detectable and would have no discernible effect.
- ***Minor*** impacts would be slightly detectable, but would not be expected to have an overall effect.
- ***Moderate*** impacts would be clearly detectable and could have an appreciable effect.
- ***Major*** impacts would have a substantial, highly noticeable effect.

3.2.4 Type of Impact

Impacts were evaluated in terms of whether they would be beneficial or adverse.

- ***Beneficial impacts*** would improve resources/conditions.
- ***Adverse impacts*** would deplete or negatively alter resources/conditions.

A brief methodology for assessing specific impacts is defined under each impact topic.

Cumulative Impacts. The Council on Environmental Quality's regulations to implement NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 Code of Federal Regulations [CFR] §1508.7). Cumulative impacts are addressed for all of the alternatives considered.

Cumulative impacts were determined by combining the impacts of the alternative being considered with other past, present, and reasonably foreseeable future actions. It was therefore necessary to identify other ongoing or reasonably foreseeable future projects at GGNRA and/or Fort Baker and, if applicable, the surrounding region.

Actions identified by NPS that have the potential to have a cumulative impact in conjunction with the project include those roadway projects listed in the Main Headlands and Fort Baker TIMP, the Fort Baker Plan, and the Draft Alexander Avenue Planning Study.

3.3 Transportation

3.3.1 Introduction

This section describes existing transportation conditions within the project area, including vehicular traffic, transit service, and bicycle and pedestrian use and safety. This section evaluates the proposed project's effect on transportation along Alexander Avenue and at the Alexander Avenue/Danes Drive intersection.

3.3.2 Regulatory Framework

Refer to Chapter 2, Alternatives, for a description of the design guidelines used in the formulation of the proposed project.

3.3.3 Affected Environment

Vehicular Access. The Alexander Avenue/Danes Drive intersection is an important component of the GGNRA Marin Headlands area transportation network. The intersection provides access to Fort Barry and Rodeo Beach, as well as a number of hiking trails, west of the project area via the Baker-Barry Tunnel. As an access road to multiple recreation areas, daily traffic volumes tend to be higher on weekends than on weekdays.

As part of the Draft Alexander Avenue Planning Study, turning movement counts (TMC) were collected for the Alexander Avenue/Danes Drive intersection during the weekday morning and evening peak periods as well as during the peak weekend afternoon period. The TMC reveal where within the project area the higher weekend traffic volumes exist. For example, there were 195 vehicles turning right from eastbound Danes Drive to Alexander Avenue during the weekday evening peak period as compared to 409 vehicles during the weekend afternoon period. In addition, vehicle queue counts at the northbound left-turn lane from Alexander Avenue onto Danes Drive were collected for two hours during a typical peak weekend traffic condition. These queues were typically noted to be two to four vehicles long, with seven as the longest recorded vehicle queue.

Transit. Transit service to the Marin Headlands area is limited. On Sundays and holidays only the San Francisco MUNI Route 76 line carries passengers from downtown San Francisco to destinations in the Marin Headlands. North of the Golden Gate Bridge, Route 76 exits US 101 at Alexander Avenue adjacent to Fort Baker before crossing under US 101 to serve the majority of popular visitor destinations in the southern Marin Headlands, including Battery Spencer, the rifle range, the riding stables, the visitor center, the Nike missile site, Battery Alexander, the Point Bonita Lighthouse, and Rodeo Beach. The bus line does not serve Fort Baker. Bus shelters or stand-alone signs indicating bus service are not provided within the Marin Headlands. Yellow stripes and directional arrows painted on the pavement indicate the route and stops.

Golden Gate Transit (GGT) Route 10 provides service to the Fort Baker area. Route 10 bus stops are located near the Alexander Avenue/US 101 interchange, at the Alexander Avenue/East Road intersection, and at the Alexander Avenue/Danes Drive intersection. None of these stops serve popular destinations in the Marin Headlands or Fort Baker, nor do they provide connections to MUNI's Sunday service to the Marin Headlands.

Nonmotorized Transportation. Bicyclists can access the Marin Headlands and Fort Baker from either San Francisco or Sausalito. On weekends, bicyclists must use the Golden Gate Bridge west sidewalk, eliminating the need to cross under the bridge to access the Marin Headlands. With the current closure of Lower Conzelman Road, the only way for bicyclists to access Fort Baker is through Vista Point, requiring them to cross vehicular traffic twice (the Vista Point off-and on-ramps) before joining the pathway parallel to US 101 and then following Alexander Avenue to Danes Drive or East Road. From

Sausalito, bicyclists may ride along the shoulders of Alexander Avenue to the Danes Drive or the East Road bicycle lane. The Danes Drive Class 2 bicycle lane, which is interrupted by a right-turn lane for cars heading down Bunker Road, feeds into the Class 2 bicycle lanes of the Barry-Baker Tunnel. Except for the Barry-Baker Tunnel and several hundred feet on either side of its entrances on Bunker Road, bicycle lanes are not provided on the park's roadway network in the Marin Headlands; bicyclists must share the roadway with automobiles. In addition, pedestrians can access the Marin Headlands and Fort Baker via Alexander Avenue.

As part of the Draft Alexander Avenue Planning Study, vehicle volumes were compared to bicycle volumes along the Alexander Avenue corridor. The traffic conditions analysis reviewed existing average daily traffic (ADT), turning movement counts and intersection operations, as well as bicycle volumes. Traffic counts were conducted between October 14 and October 20, 2009. Existing vehicle and bicycle volumes can be summarized as follows:

- Vehicles
  - 8,700 weekday ADT on Alexander Avenue south of Danes Drive
  - 13,050 weekend ADT on Alexander Avenue south of Danes Drive
- Bicycle
  - 240 bicycles counted during a Saturday afternoon from 3:00 p.m. to 5:00 p.m. at the Alexander Avenue/Danes Drive intersection[1]
  - 490 bicycles were counted during a peak hour Saturday[2]

During the morning weekday peak period, the percentage of bicycles compared to total traffic (bicycles plus vehicles) is 5 to 7 percent along the corridor. During the evening peak period, the percentage of bicycles ranges from 8 percent on the south end of the corridor to 16 percent near Sausalito. On weekends, the percentage of bicycles ranges from 16 percent on the south end of the corridor to 33 percent near Sausalito.

3.3.4 Methodology

This section provides a qualitative evaluation of the effects of Alternative A and the three action alternatives on transportation within the project area. The analysis is primarily based on information provided in the Draft Alexander Avenue Planning Study and in the TIMP EIS. The alternatives under consideration would not lead to an increase in traffic at Alexander Avenue or Danes Drive, nor would they cause the level of service at the Alexander Avenue/Danes Drive intersection to deteriorate. As described in Chapter 1, Purpose of and Need for Action, the proposed project is intended to enhance the quality and safety of multi-modal transportation uses within the project area; therefore, long-term transportation effects were analyzed in terms of the project's effect on vehicular safety.

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1 Bicycle counts were collected in October, 2009 by Atkins.
2 Bicycle counts were collected in May, 2008 by Central Federal Lands Highway District.

Vehicular safety refers to the safe movement and travel speed of vehicles through the project area. A safe road network ensures that vehicles have adequate sight distances at corners, intersections, and parking areas; minimizes the possibility for conflicts among motorized vehicles, pedestrians, and bicyclists; and that allows for vehicles to easily stay within their travel lanes. Each alternative was evaluated on the basis of its expected impact on vehicular safety according to the following impact thresholds:

- *Negligible:* There would not be a perceptible change in vehicular safety.
- *Minor:* Slight changes to vehicular safety conditions at selected locations would be detectable to the visitor population.
- *Moderate:* Changes to vehicular safety conditions would be clearly detectable and could have an appreciable effect.
- *Major:* Changes to vehicular safety conditions would be clearly detectable and would dramatically change the possibility for roadway accidents.

An improvement in vehicular safety, including the potential for reducing the number of roadway accidents in the park, would be considered a beneficial impact. A reduction in vehicular safety, including the increased potential for roadway accidents, would be an adverse impact.

In the short term, construction activities could affect traffic conditions within the project area and surrounding roadways; therefore, short-term effects were analyzed in detail, below. Short-term effects associated with road delays, closures, and detours are addressed under Section 3.5, Visitor Experience.

3.3.5 Alternative A: No Action Alternative

Alternative A would result in no changes to the Alexander Avenue/Danes Drive intersection or Alexander Avenue. Existing conditions within the project area would persist under this alternative. As such, the deficiencies associated with multi-modal use and intersection geometry would remain unchanged.

As identified in the Draft Alexander Avenue Planning Study, the conditions and widths of the existing shoulders on Alexander Avenue vary throughout the corridor. On average, shoulder width varies between 2-5 feet throughout the Alexander Avenue corridor. In multiple locations, including the section of Alexander Avenue between the US 101 interchange and the Alexander Avenue/Danes Drive intersection, the roadway shoulders vary between one and three feet and have degraded to a point that pedestrians and bicyclists are required to enter the travel way in order to continue along the corridor. Rock material from the side slopes, loose gravel, narrow widths, and cracked pavement also make it difficult for users to travel in the shoulder. Figure 3-1 shows the existing northbound shoulder condition along the section of Alexander Avenue within the project area.

Figure 3-1
Existing Shoulder Conditions on Alexander Avenue

Figure 3-2
Existing Alexander Avenue/Danes Drive Intersection Configuration.

For Alternative A, the geometry of the Alexander Avenue/Danes Drive intersection would remain in a "Y" configuration. The existing intersection geometry creates a compromised line-of-site for vehicles turning right from eastbound Danes Drive onto Alexander Avenue (see Figure 3-2). In addition, the existing deceleration length and queuing capacity of the northbound left-turn lane from Alexander Avenue to Danes Drive is insufficient under peak traffic conditions. Once the left-turn lane reaches storage capacity, vehicles begin to encroach on the main northbound travel lane along Alexander Avenue. Alternative A would result in a long-term, local, and moderate adverse effect on vehicular safety in the project area. Because this alternative would not require construction activities, there would be no short-term effects on transportation.

Cumulative Effects. The transportation improvements considered for the proposed project were included in both the Fort Baker Plan EIS ROD as an Offsite Transportation Enhancement measure and the FEIS for the TIMP and is an important component of the overall GGNRA Marin Headlands area transportation network. Currently, there are plans to rehabilitate multiple sections of the Alexander Avenue corridor as identified in the Draft Alexander Avenue Planning Study and to improve the entire Marin Headlands and Fort Baker transportation system as described in the TIMP. Further, it is anticipated that completion of the TIMP will result in increased travel demand, which would compound the existing congestion issue in the left-turn lane from Alexander Avenue to Danes Drive. Therefore, implementation of Alternative A would inhibit the effectiveness of the larger, corridor-wide, and region-wide transportation improvement plans and would result in long-term, minor adverse cumulative effects.

Conclusion. Alternative A would result in long-term, local, and moderate adverse effects on vehicular safety in the project area due to the continuance of insufficient shoulder width and skewed roadway and intersection configuration. However, there would be no short-term, construction-related effects associated with Alternative A.

3.3.6 Alternative B: 16-Foot Catchment Alternative

Under Alternative B, a new cut slope along Alexander Avenue would be established to allow for a 16-foot rockfall catchment ditch at the toe of the slope, two 12-foot-wide vehicle lanes, and 5-foot shoulders along Alexander Avenue. According to the Preliminary Geotechnical Investigation Report (prepared for the proposed project), materials contained within the east slope of the rock cut are conducive to using standard excavation equipment.[3] Blasting may be necessary to remove areas of harder rock. If blasting operations are not necessary, excavation of the rock cut would be conducted during daytime hours along with construction of the retaining wall above the Bunker Road Arch Tunnel, existing pavement removal, roadway grading, roadway lighting relocation, drainage measures, guardrail replacement, paving, and other minor miscellaneous work. During construction, traffic during daytime hours would be restricted to one lane along Alexander Avenue between the US 101 interchange and Danes Drive. Bicycles and pedestrians would be advised to use an alternative route traveling under US 101 at Vista Point and using Lower Conzelman Road. If, during final design, it is determined that enough space is available to safely allow bicycles and pedestrians to travel through the

[3] Yeh and Associates, Inc., *Preliminary Geotechnical Investigation Report,* Danes Drive Ca PRA/NPS GOGA 268(1), Golden Gate National Recreation Area, California, August 14, 2009.

construction zone they would be allowed to do so. Otherwise, bicycles and pedestrians would be detoured during construction. The transit stop at Danes Drive would be temporarily relocated next to the existing stop while it is reconstructed.

If blasting operations are necessary, they would be performed at night to limit traffic delays. Traffic would be detoured during the blasting operations. The road closure would occur from the northbound US 101 off-ramp intersection to the Danes Drive intersection along Alexander Avenue. Potential detour routes include:

- For access to Marin Headlands from the Golden Gate Bridge, all vehicles and bicycles would be detoured southbound on Alexander Avenue, west on Conzelman Road to McCullough Road, follow McCullough Road to Bunker Road where the detour would end and traffic would use existing wayfinding signs to find their way.
- For vehicle access to Fort Baker from the Golden Gate Bridge, all vehicles would be detoured southbound on Alexander Avenue, west on Conzelman Road to McCullough Road, follow McCullough Road to Bunker Road, east on Bunker Road through the Baker-Barry tunnel and then turn left onto East Bunker Road, which accesses Fort Baker. Bicycles would be detoured down Lower Conzelman Road to access Fort Baker.
- For vehicle access to Sausalito, two vehicle options are available:
- From the Golden Gate Bridge, all vehicles would be detoured southbound on Alexander Avenue, west on Conzelman Road to McCullough Road, follow McCullough Road to Bunker Road, east on Bunker Road through the Baker-Barry Tunnel and connect back to Alexander Avenue at the Danes Drive where the detour would end and traffic turn left onto Alexander Avenue and proceed north into Sausalito.
- From the Golden Gate Bridge, vehicles would be advised to not exit at Alexander Avenue and proceed north on US 101 to either of the next two exits (Rodeo Avenue or Sausalito/Marin City) that provide access to Sausalito. The Sausalito/Marin City exit would be signed as the detour route. Local residents that know the local road network could also use the Rodeo Avenue exit.

According to turning movement counts conducted for the TIMP EIS, the intersections involved in the traffic detour routes operate at level of service (LOS) A under existing conditions. LOS A indicates free-flow conditions with minimal delay.[4] This alternative would include a construction traffic management plan to reduce potential effects on traffic conditions when detour routes are in place. Furthermore, the closure of Alexander Avenue would be temporary and traffic detours would be short term; therefore, redirecting traffic during construction to allow for blasting operations would not have an adverse effect on traffic conditions along the detour routes. Short-term impacts due to construction would be local, minor, and adverse.

[4] Level of Service is a qualitative description of the performance of an intersection based on the average delay per vehicle. Intersection levels of service range from LOS A, which indicates free flow or excellent conditions with short delays, to LOS F, which indicates congested or overloaded conditions with extremely long delays.

Lengthening the median left-turn lane from Alexander Avenue onto Danes Drive and the widening the existing shoulders along Alexander Avenue would enhance the function and safety of the roadway. In addition, these modifications would assure compliance with the American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities standards, which requires that at least 5 feet of mixed-use shoulder width be provided if a separate lane cannot be dedicated to the cyclists.[5]

Reconfiguring the Alexander Avenue/Danes Drive intersection from a "Y" configuration to a "T" would improve the vehicular line of sight. Replacing existing guardrails with approved steel-backed timber rails would further enhance vehicular safety. In the long term, by reducing the potential for conflict between vehicular and non-vehicular traffic through road widening, improving vehicular line of sight through intersection reconfiguration, replacing the existing guardrails along Alexander Avenue, and taking measures to reduce the potential for rockfall hazards, Alternative B would result in a long-term, local, and moderate beneficial effect on vehicular, bicycle, and pedestrian safety within the project area.

Cumulative Effects. The transportation improvements considered for the proposed project were included in both the Fort Baker Plan EIS ROD as an Offsite Transportation Enhancement measure and the FEIS for the TIMP. The environmental effects of these same improvements were evaluated in the TIMP EIS as a common element to all of the alternatives considered in the TIMP. The TIMP EIS cumulative analysis determined that none of the roadway improvements included in the TIMP would result in adverse cumulative effects related to transportation (including Alternative B improvements); therefore, Alternative B would also not result in adverse cumulative effects related to transportation. The TIMP EIS determined that all cumulative effects associated with the multiple roadway projects included in the TIMP would be beneficial to transportation in the GGNRA Marin Headlands area. Therefore, implementation of this alternative would have a long-term, moderate, and beneficial cumulative effect on transportation in the GGNRA Marin Headlands area.

Conclusion. There would be a local, long-term, moderate, beneficial impact on vehicular, bicycle, and pedestrian safety in the project area. Past, present, and future projects considered as cumulatively considerable would further enhance transportation within the GGNRA Marin Headlands area, and would therefore result in long-term, minor, and beneficial cumulative effects. Short-term impacts due to construction would be local and regional, minor, and adverse.

3.3.7 Alternative C: 5-Foot Catchment Alternative

For Alternative C, the existing rock cut along Alexander Avenue would be excavated to allow a 5-foot rockfall catchment ditch to be constructed at the toe of the cut slope. To compensate for the narrower rockfall catchment ditch, the entire face of the east slope would be covered with rockfall mesh. With the exception of the rockfall catchment and the application of rockfall mesh, Alternative C would include all project components of Alternative B. Construction activities required to implement

[5] American Association of State Highway and Transportation Officials, *Guide for Development of Bicycle Facilities,* Washington, D.C., 1999.

Alternative C, including the rock cut, would follow the construction schedule described under Alternative B above. Although the duration of excavation for Alternative C would be shorter than Alternative B, installing rockfall mesh would make Alternative C construction take longer in total. Because Alternative C would redirect traffic along the same detour routes as Alternative B, short-term impacts on traffic conditions would be the same as Alternative B. Long term impacts on vehicular, bicycle, and pedestrian safety in the project area would also be the same as Alternative B.

Cumulative Effects. Alternative C would have the same cumulative effects on vehicular safety and traffic conditions as described under Alternative B above.

Conclusion. With regard to traffic impacts, Alternative C would result in the same effects as determined for Alternative B.

3.3.8 Alternative D: 8-Foot Catchment Alternative

For Alternative D, the existing rock cut along Alexander Avenue would be excavated to allow an 8-foot rockfall catchment ditch to be constructed at the toe of the cut slope. The construction activities required to implement Alternative D would follow the construction schedule described for the previous two action alternatives. Alternative D would direct traffic along the same detour routes as described for the previous two action alternatives and, therefore, short-term impacts on traffic conditions would be the same as those identified for Alternative B and Alternative C. Long term impacts on vehicular, bicycle, and pedestrian safety in the project area would also be the same as the previous two action alternatives.

Cumulative Effects. Alternative D would have the same cumulative effects on vehicular safety and traffic conditions as described for the previous two action alternatives, above.

Conclusion. With regard to traffic impacts, Alternative D would result in the same effects as determined for Alternative B and Alternative C.

3.4 Visual Resources

3.4.1 Introduction

This section summarizes the existing visual character of the project area and describes visual resources and views of the surrounding area including Fort Baker. In addition, this section identifies applicable plans, policies, and regulations associated with the protection of visual resources and also evaluates the proposed project's affect on visual resources within the project area.

3.4.2 Regulatory Framework

NPS Management Policies 2006. NPS Management Policies 2006 describes scenic views as highly valued characteristics of the natural resources, processes, systems, and values found in national parks. NPS Management Policies 2006 emphasizes that facilities and construction need to minimize visual intrusions in the natural landscape, and need to be considered in locating facilities and park infrastructure. A specific example is in Section 4.7.1, Air Quality, of the NPS Management Policies 2006, which directs NPS to "perpetuate the best possible air quality in parks to (1) preserve natural

resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas." Additionally, Section 1.4.6 states, "the park's scenery, natural and historic objects, and wildlife, and the processes and conditions that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it; scenic features; natural visibility, both in daytime and at night; natural landscapes; natural soundscapes and smells; water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structures, and objects; museum collections; and native plants and animals."[6]

3.4.3 Affected Environment

Visually, the regional landscape is one of contrasts and complements. The horizontal lines of bay and ocean, and the edges of their meeting with land, are complemented by the ridgelines of rolling hills and gently rounded forms of low-growing coastal scrub and grasslands, which are repeated in the visible horizontal corridors of State Route 1 and US 101. In the project area, the majority of Alexander Avenue travels through a narrow rock cut with steep slopes on the east and west sides that limit long-range views. The Alexander Avenue/Danes Drive intersection is located at the northern end of the existing rock cut. At this point Alexander Avenue traverses across an open ridgeline providing views of Fort Baker, the San Francisco Bay, the Bay Bridge, and the San Francisco skyline to the east. From the Alexander Avenue/Danes Drive intersection, US 101 can be seen to the west.

Views to the project area are limited due to local topography. The project area can be seen intermittently from US 101 just south of the Waldo Tunnel. The portion of Alexander Avenue that crosses the Bunker Road Arch Tunnel can be seen from the eastern section of Seitler Road at Fort Baker. In general, views of the project area from Fort Baker are highly obstructed by vegetation and steep topography. Photos of the project area are included in Figure 3-3.

3.4.4 Methodology

The assessment of impacts considers whether the resulting visual change would have an adverse or beneficial effect on a scenic vista, would substantially damage or improve scenic resources, and would substantially degrade or improve the existing visual character of the site. The description of the visual information (the landform and water, vegetation and manufactured development cover) within the project area, as well as its visual character and quality, serves as a baseline of existing conditions against which to measure the potential impacts associated with the four alternatives considered in this EA. Visual impacts are considered from both the perspective of views *from* the project area and views of the project area itself. Views of the project area and views of the surrounding area from the project area are evaluated on their relative degree of vividness, intactness, and unity, as modified by the "visual sensitivity" of the viewer. Viewer sensitivity is based on the visibility of resources in the landscape, the proximity of viewers to the visual resource, the frequency and duration of viewing, the number of viewers, and the type and expectations of individuals and viewer groups.

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[6] National Park Service, *Management Policies 2006*, website: http://www.nps.gov/policy/MP2006.pdf, accessed June 30, 2011.

Alexander Avenue North of Danes Drive

Bunker Road Arch Tunnel from Seitler Road

View of US 101 from Danes Drive

View from Alexander Avenue - Danes Drive Intersection

***Source*:** Atkins, 2011.

Figure 3-3
Views of Project Area

A short-term impact would be temporary due to construction, restoration, or demolition activities. A long-term impact would be permanent and continual. Beneficial impacts would enhance the existing landscape character, the access to historically important viewpoints or a sequence of viewpoints, or the visibility of a viewpoint or sequence of viewpoints. Adverse impacts include effects that would reduce the existing landscape character, the access to historically important viewpoints or a sequence of viewpoints, or the visibility of a viewpoint or sequence of viewpoints.

The level of impact was determined by assessing the following:

- Potential of proposed elements to alter immediately surrounding views.
- Potential of proposed elements to affect distance views.
- Effectiveness of mitigation measures for adverse impacts to avoid or reduce impacts associated with the proposed elements.

The following impact intensities were defined for impacts on visual and aesthetic resources:

- *Negligible:* The impact would be imperceptible or not detectable.
- *Minor:* The impact would be slightly detectable or localized within a relatively small area.
- *Moderate:* The impact would be readily apparent (i.e., the landscape character would change).
- *Major:* The impact would be substantial, highly noticeable, and/or result in changing the character of the landscape in a way that would cause substantial degradation or improvement (e.g., adding light structures to an area where no light exists, or placing a new building in an existing pristine area).

3.4.5 Alternative A: No Action Alternative

For Alternative A, the existing landscape character of the project area, including all historically significant aspects of Alexander Avenue would remain unchanged. Views of Fort Baker, the Bay, the San Francisco skyline, and the Bay Bridge from the Alexander Avenue/Danes Drive intersection would remain unchanged. As such, implementation of Alternative A would have no effect on existing visual resources in the study area.

Cumulative Effects. Alternative A would have no effect on visual resources within or surrounding the project area; therefore, when considered in the context of other past, present and future projects; this alternative would not contribute to cumulative visual resource effects.

Conclusion. Alternative A would have no long-term or short-term effect on visual resources in the project area.

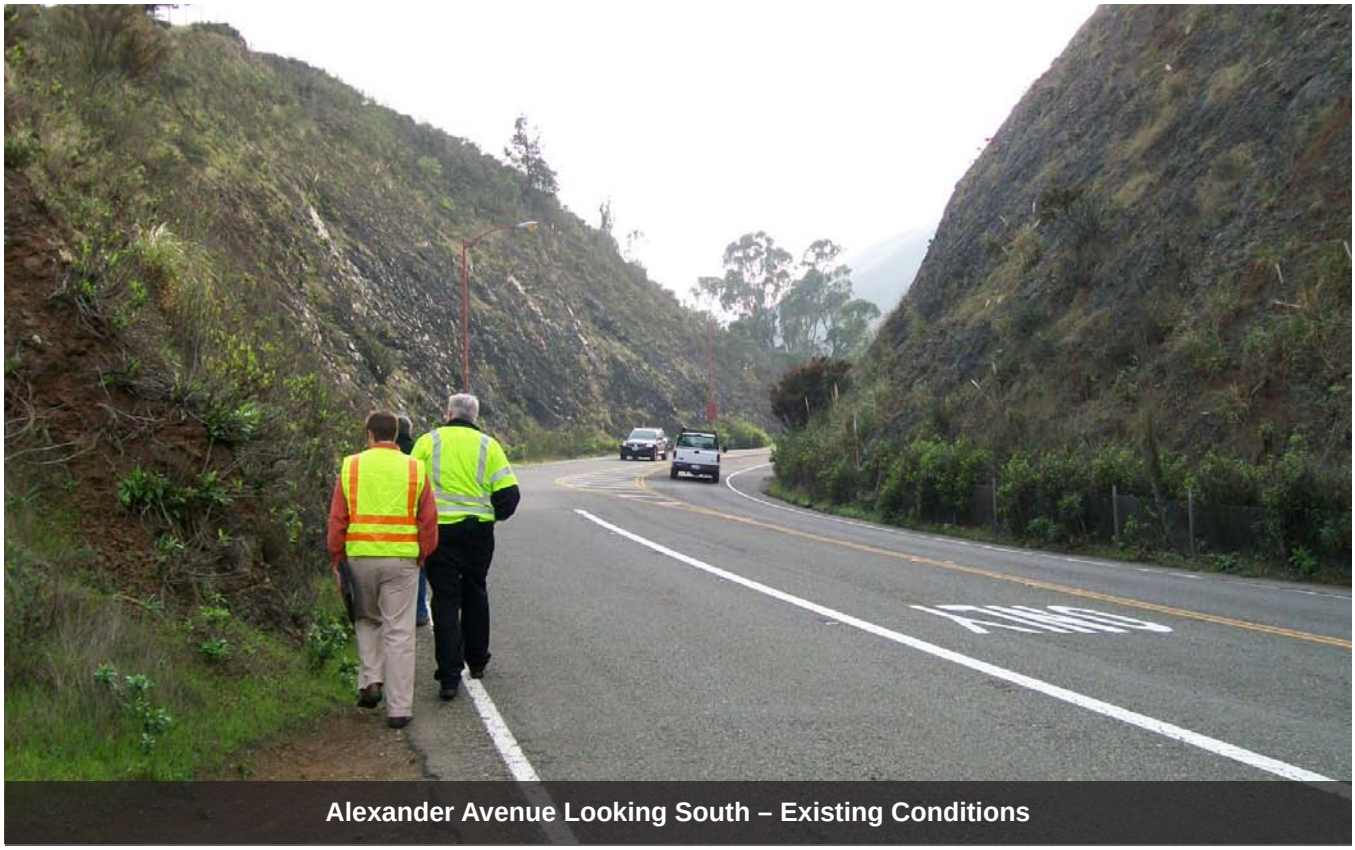
3.4.6 Alternative B: 16-Foot Catchment Alternative

Construction activities associated with Alternative B would be visible from multiple locations surrounding the project area, including US 101 to the west, Alexander Avenue (north of the project

area), East Bunker Road, and from limited locations within Fort Baker. Construction activities would include, but would not be limited to, cut and fill operations, grading, paving, and drilling. These activities could potentially obstruct views of the San Francisco Bay looking east from the Alexander Avenue/Danes Drive intersection. Additionally, because the project area is visually consistent with the surrounding hillsides and ridgelines, construction equipment and establishment of exposed soil during construction of Alternative B would be disruptive to the visual consistency and unity of the area. However, construction activities would be temporary and would only affect views of and from the project area in the short term. Further, the project area is primarily visible from surrounding roads and highways. From these locations views of the project area would be brief and distracted, and viewers would be less sensitive to the aesthetic effects of construction as compared to views from a stationary vantage point.

The section of Alexander Avenue where road widening activities would occur above the Bunker Road Arch Tunnel can be seen from the eastern section of Seitler Road at Fort Baker. In general, views of the project area from Fort Baker are obstructed by vegetation and steep topography. There are no prominent visual resources in the project area, and under existing conditions visibility of the project area from Fort Baker is poor. As such, Alternative B would result in minor, short-term adverse construction-related effects on visual quality of the project area.

After construction, the Alexander Avenue/Danes Drive intersection would remain within existing roadway right-of-way. Vegetation removed during construction, including approximately four eucalyptus trees near the end of the northbound US 101 off-ramp and three trees along the top of the existing east cut slope, would be replaced in accordance with NPS guidelines. The existing guardrail, chainlink fence, and light poles would be replaced in kind. Figure 3-4 includes an existing view looking south along Alexander Avenue and a photo simulation showing the same view with implementation of Alternative B. As shown, the project area's long-term appearance would remain similar to the existing visual character of the site; however, the implementation of Alternative B would result in the excavation of the existing rock cut along Alexander Avenue. For this alternative the new cut would be designed to allow for construction of a 16-foot rockfall catchment ditch at the toe of the slope. After excavation the east slope would approximately 77 feet tall. Alternative B would not require rockfall mesh. After excavation, the rock cut would retain a similar appearance to existing conditions. In the short term, existing vegetation covering the exposed rock cut would be removed, but would grow back over time. Views of the east slope rock face are limited to vehicles, pedestrians, and bicycles that pass through the rock cut on Alexander Avenue; therefore, views of the rock cut would be limited in duration and modification of the cut would have a minimal visual impact.



Alexander Avenue Looking South – Existing Conditions

Alexander Avenue Looking South – With Alternative B

***Source*:** Atkins, 2011.

100017371 | Alexander Ave-Danes Drive

Figure 3-4

East Rock Cut after Implementation of Alternative B

Alternative B would widen Alexander Avenue to allow for two 12-foot-wide vehicle lanes, the extension of the median left-turn lane, and the establishment of 5-foot wide shoulder along both sides of the roadway. Although widened, Alexander Avenue would remain a two-lane roadway within the existing right-of-way. The roadway characteristics would be only marginally affected. As described above, views of the roadway are limited and brief; therefore, Alternative B would result in minor long-term adverse effects on visual resources.

Cumulative Effects. Other projects in the Fort Baker and Marin Headlands area include the Fort Baker Plan, the TIMP, and the Draft Alexander Avenue Planning Study. The EIS completed for the TIMP included the proposed project as a transportation element of the Fort Baker Plan. The TIMP EIS cumulative analysis determined that none of the roadway improvements included in the TIMP would result in adverse cumulative effects related to visual resources. Therefore, Alternative B would also not result in adverse cumulative effects related to visual resources. Further, the TIMP EIS found that cumulative effects associated with current and future projects in the Fort Baker and GGNRA Marin Headlands area would be beneficial with regard to visual resources.

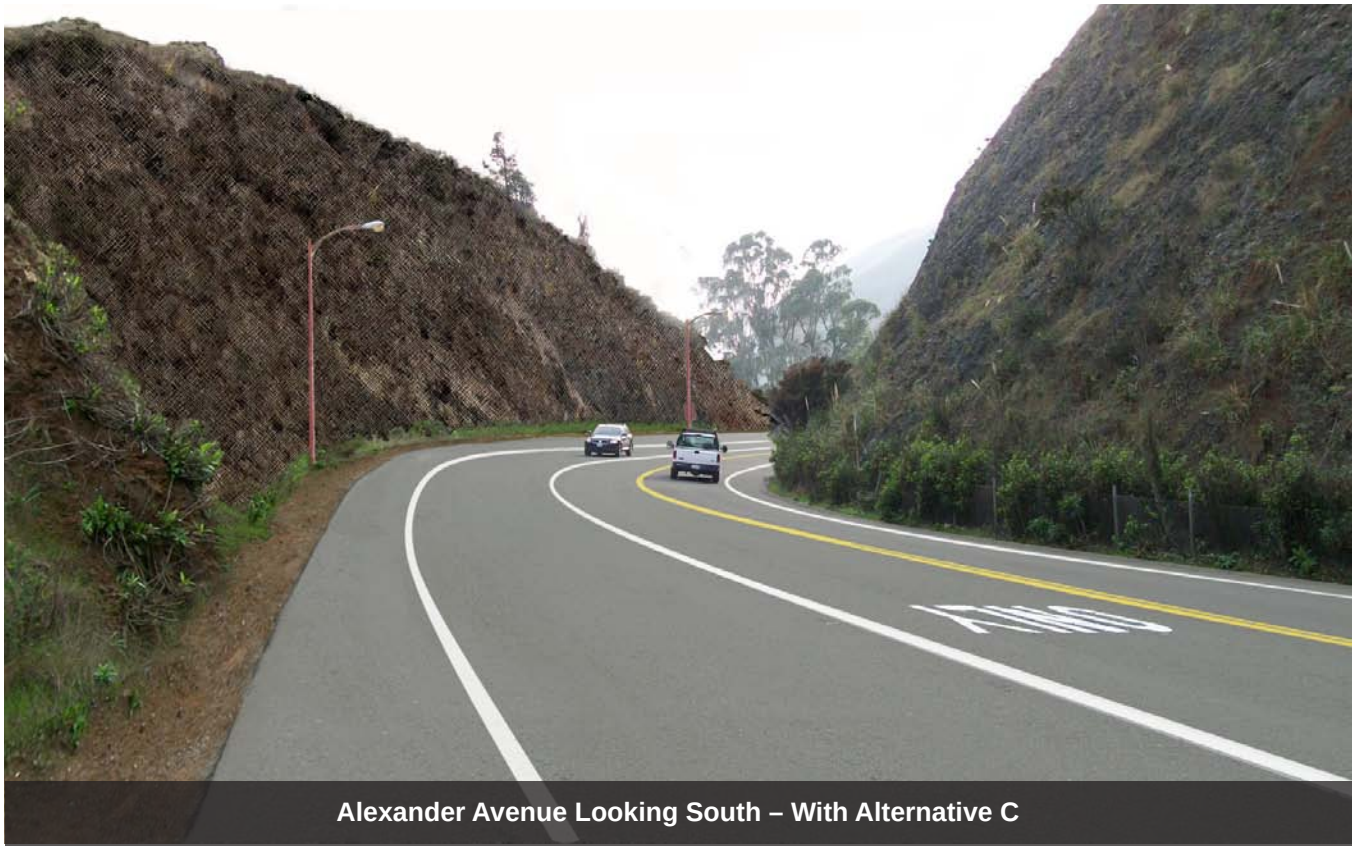
Conclusion. Alternative B would result in local, minor, short-term adverse construction-related effects on visual quality of the project area. Long-term effects from implementation of this alternative would be local and minor.

3.4.7 Alternative C: 5-Foot Catchment Alternative

Alternative C would reduce the extent of the new cut along the east slope as compared with Alternative B by reducing the width of the rockfall catchment ditch to 5 feet as opposed to 16 feet. To compensate for the narrower rockfall catchment ditch, the entire face of the east slope would be covered with rockfall mesh. Figure 3-5 shows a photo simulation showing the rock cut along Alexander Avenue with implementation of Alternative C. Although the mesh would be stained to blend in with the exposed rock face of the east slope, it would be visible from Alexander Avenue. With the exception of the rockfall catchment and application of rockfall mesh, all project components for Alternative B would be similar for Alternative C. Additionally, construction activities required to implement Alternative C, including the rock cut, would be similar to those necessary for implementation of Alternative B. Short-term construction-related effects on visual resources within the project area would be the same as described under Alternative B. The long-term appearance of the project area would be slightly different under Alternative C compared to Alternative B. The extent of the rock cut would be reduced under Alternative C, but rockfall mesh would be required; therefore, Alternative C would result in moderate, long-term adverse effects on visual resources.

Cumulative Effects. The cumulative effects of Alternative C would be the same as described under Alternative B, above.

Conclusion. Alternative C would result in local, minor, short-term adverse effects on the visual quality of the project area; long-term effects would be local, moderate, and adverse.



Alexander Avenue Looking South – With Alternative C

Alexander Avenue Looking South – With Alternative D

***Source*:** Atkins, 2011.

100017371 | Alexander Ave-Danes Drive

Figure 3-5

East Rock Cut after Implementation of Alternative C and Alternative D

3.4.8 Alternative D: 8-Foot Catchment Alternative

Alternative D would excavate the east slope of the rock cut along Alexander Avenue to accommodate an 8-foot wide rockfall catchment ditch at the toe of the slope. Alternative D would install a temporary rockfall barrier between the roadway and the catchment ditch and would forgo the use of rockfall mesh. Figure 3-5 shows a photo simulation showing the rock cut along Alexander Avenue with implementation of Alternative D, with the temporary barrier along the roadway. Installation of the temporary barrier would introduce a new minor aesthetic element to the rock cut. The width of the catchment ditch under Alternative D would be similar to that of Alternative C, however no rockfall mesh would be installed under Alternative D. Therefore, implementation of Alternative D would result in minor, local, long-term adverse effects on visual resources similar to Alternative B. Short-term construction-related effects on visual resources within the project area would be the same as described under the previous two action alternatives.

Cumulative Effects. The cumulative effects of Alternative D would be the same as described under the previous two action alternatives, above.

Conclusion. Alternative D would result in local, minor, short-term adverse effects on the visual quality of the project area; long-term effects would be local, moderate, and adverse. Alternative D would result in local, minor, short-term adverse construction-related effects on visual quality of the project area. Long-term effects from implementation of this alternative would be local, minor, and adverse.

3.5 Visitor Experience

3.5.1 Introduction

This section summarizes existing conditions within the project area as they relate to the character and quality of the visitor experience while in the GGNRA. As a transportation corridor, the project area primarily serves as an access point to various destinations within the GGNRA Marin Headlands area. As such, this section evaluates the proposed project's effect on access and multi-modal mobility within the project area.

3.5.2 Regulatory Framework

The 1980 *General Management Plan* includes the following management objectives related to visitor use and experience:

- *Making the recreation area readily available to the broadest variety of park users*. This objective is to be achieved by pursuing the extension of transit services into the park; offering recreational opportunities to a diversity of park users; imparting knowledge through interpretation, education, and information programs; and encouraging community organizations to use park areas for recreation and educational programs.

- *Providing a broad variety of park experiences*. This objective is to be achieved by offering a wide variety of uses; developing a trail system for hikers, cyclists and equestrians; providing overnight opportunities; and providing commercial services where needed.

3.5.3 Affected Environment

Alexander Avenue is an important transportation corridor providing access to Sausalito from the Golden Gate Bridge, and to multiple destinations within the GGNRA and Fort Baker. The Alexander Avenue corridor is an important facility for commuter and recreational bicycle traffic and pedestrians often use the path and shoulder of the road. Between October 14 and October 20, 2009, bicycle count information was collected at various points along Alexander Avenue. On a Saturday at Alexander Avenue and Danes Drive, there were a total of 490 bicycles during the peak hour. Pedestrian volumes were minimal at the Alexander Avenue/Danes Drive intersection ranging from 0 to 10 pedestrians per hour. In addition, vehicle volumes were compared to bicycle volumes along the corridor when peak hour counts were conducted. During the morning weekday peak period, the percentage of bicycles compared to total traffic (bicycles plus vehicles) is 5 to 7 percent along the corridor. During the evening peak period, the percentage of bicycles ranges from 8 percent on the south end of the corridor to 16 percent near Sausalito. On weekends, the percentage of bicycles ranges from 16 percent on the south end of the corridor to 33 percent near Sausalito. Although bicyclists represent a significant user group, within the project area, Alexander Avenue provides insufficient shoulder width, resulting in the need for bicycles to enter the main travel lane.[7]

3.5.4 Methodology

Impacts on visitor experience were determined through an assessment of changes in access to park uses and the quality of visitors' experiences while undertaking popular activities within the project vicinity. Short-term impacts would be related to construction activities. Long-term impacts would result from permanent changes in access to recreation activities and the types of activities available in the project area. Beneficial impacts would result from improvements in access to activities or the enjoyment associated with visitor activities. Adverse impacts would result from reduction in access to visitor activities, reduction in the range of activities, or changes that would reduce visitor enjoyment. Specific methodologies and impact intensities were used to analyze access to park partner activities and the variety of park experiences, as described below.

- *Negligible:* Visitors would not be affected or changes in visitor use and/or experience would also be below or at the level of detection and any effects would be short term.
- *Minor:* Changes in visitor use and/or experience would be detectable although the changes would be slight and short-term.
- *Moderate:* Changes in visitor use and/or experience would be readily apparent and likely long term. The visitor would be aware of the effects associated with the actions. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.

[7] Federal Highway Administration, *Draft Alexander Avenue Planning Study*, March 25, 2011.

- *Major:* Changes in visitor use and/or experience would be readily apparent, severely adverse or exceptionally beneficial and have important long-term consequences. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

3.5.5 Alternative A: No Action Alternative

For Alternative A, the existing roadway characteristics and intersection configuration in the project area would remain unchanged. Visitor experience would be affected by Alternative A because there would be no improvements to the inadequate shoulder width for bicycle and pedestrian use along Alexander Avenue. Further, improvement of the left-turn lane from Alexander Avenue to Danes Drive, which provides access to the Marin Headlands, Fort Barry, Rodeo Beach, and other scenic and recreation opportunities would not be lengthened. Under current peak hour traffic conditions, this left-turn lane does not provide adequate storage capacity for vehicles. As a result vehicles tend to back up into the main travel lane and this condition would continue with the implementation of Alternative A. In the long-term, as vehicular, bicycle, and pedestrian volumes increase over time, the existing deficiencies would be exacerbated and visitor experience would be compromised due to deficient transportation infrastructure. However, this alternative would not require construction activities and would have no short-term effects. This alternative would have long-term, local, moderate, and adverse effects on visitor experience related to multi-modal opportunities and safety within the project area.

Cumulative Effects. Cumulative land use and transportation improvement projects within the GGNRA include those described in the Fort Baker Plan, the Draft Alexander Avenue Planning Study, and the TIMP. A common purpose shared among the cumulative transportation projects is the enhancement of visitor experience through improvement of transportation infrastructure and management. The project area is significant in the GGNRA Marin Headlands area and Fort Baker transportation network. As such, Alternative A would detract from the ability of these cumulative projects to improve the overall transportation network throughout Fort Baker and the Marin Headlands. However, the project area represents a small section of this larger transportation network; therefore, the No Action Alterative would have a long-term, minor, and adverse effect on visitor experience.

Conclusion. For Alternative A, park users who visit the GGNRA via the project area would experience deficient transportation infrastructure and configuration. This alternative would result in long-term, local, moderate, and adverse cumulative effects on visitor experience.

3.5.6 Alternative B: 16-Foot Catchment Alternative

For Alternative B, the reconfiguration of the Alexander Avenue/Danes Drive intersection along with improvements to Alexander Avenue would improve long-term visitor experience associated with transportation and safety within the GGNRA. As summarized in Chapter 2, Alternatives, the components included in Alternative B would provide an adequate travel lane for bicycles and pedestrians, reduce the risk of rockfall, provide increased storage capacity for vehicles turning left on Danes Drive from Alexander Avenue, and enhance the vehicle line of sight associated with the Alexander Avenue/Danes Drive intersection. These project components would make access to the

Marin Headlands a safer and more enjoyable experience for visitors. The long-term impact on visitor experience from the implementation of Alternative B would be local, moderate, and beneficial.

In the short term, construction associated with the implementation of Alternative B could result in traffic delays and possible detours. Construction activities could make access to the GGNRA more difficult for all modes of transportation through the project area. In addition, construction-related noise could be disruptive to visitors at Fort Baker and to guests staying at the Cavallo Point Lodge as well as US Coast Guard (USCG) Station Golden Gate overnight guests.[8] Therefore, Alternative B could temporarily disturb visitor experience within the GGNRA and Fort Baker. Although adverse, the effects of construction activities on visitor experience would be local, short term, and minor.

Cumulative Effects. The cumulative projects considered in evaluation of Alternative B share a common objective to enhance visitor experience within the GGNRA. These cumulative projects are focused on improving multi-modal access through the Marin Headlands and Fort Baker as well as the Alexander Avenue corridor. The EIS completed for the TIMP included the transportation improvements considered for the proposed project as a transportation element of the Fort Baker Plan. The cumulative analysis provided in the EIS determined that none of the roadway improvements included in the TIMP would result in adverse cumulative effects related to visitor experience; therefore, Alternative B would also not result in adverse cumulative effects related to visitor experience. In fact, the TIMP EIS found that cumulative effects associated with current and future projects in the Fort Baker and GGNRA Marin Headlands area would be beneficial with regard to visitor experience. This alternative would therefore have a long term, minor, and beneficial cumulative effect on visitor experience in the Fort Baker and GGNRA Marin Headlands area.

Conclusion. By enhancing the safety of motorized and non-motorized transportation within the project area, Alternative B would result in local, moderate, long-term beneficial effects on visitor experience. However, during construction of this alternative, visitors could experience traffic delays and possible detours. This would result in minor, local, short-term adverse effects to visitors.

3.5.7 Alternative C: 5-Foot Catchment Alternative

Under Alternative C, the rock cut along Alexander Avenue would be designed to allow for a 5-foot rockfall catchment ditch at the toe of the slope. Rockfall mesh would be installed across the entire face of the east slope to compensate for the narrower catchment ditch. The design of the cut slope under Alternative C would offer the same level of rockfall protection for visitors as under Alternative B. Furthermore, Alternative C includes all the other project components included in Alternative B. Implementation of Alternative C would result in impacts similar to those described for Alternative B. Therefore, Alternative C would result in local, short-term minor and adverse effects related to construction activities and local, long-term, moderate, and beneficial effects on visitor experience in the project area.

[8] A detailed analysis of construction-related noise impacts at Fort Baker is provided in Section 3.9, Noise.

Cumulative Effects. The cumulative effects of Alternative C would be the same as described under Alternative B, above.

Conclusion. Alternative C would result in local, short-term minor and adverse effects related to construction activities and local, long-term, moderate, and beneficial effects on visitor experience in the project area.

3.5.8 Alternative D: 8-Foot Catchment Alternative

Under Alternative D, the rock cut along Alexander Avenue would be designed to allow for an 8-foot rockfall catchment ditch at the toe of the slope. A temporary rockfall barrier would be installed along Alexander Avenue, between the roadway and the rockfall catchment ditch to prevent debris from entering the traveled lanes. With the temporary rockfall barrier, the design of the cut slope under Alternative D would offer the same level of rockfall protection for visitors as the previous two action alternatives. Furthermore, Alternative D includes all the other project components included in the previous two action alternatives. Implementation of Alternative D would result in impacts similar to those described for the previous two action alternatives. Therefore, Alternative D would result in local, short-term minor and adverse effects related to construction activities and local, long-term, moderate, and beneficial effects on visitor experience in the project area.

Cumulative Effects. The cumulative effects of Alternative D would be the same as described under Alternative B, above.

Conclusion. Alternative D would result in local, short-term minor and adverse effects related to construction activities and local, long-term, moderate, and beneficial effects on visitor experience in the project area.

3.6 Cultural Resources

3.6.1 Introduction

This section summarizes the extent of cultural resources within the project area and describes applicable plans, policies, and regulations associated with the protection of cultural resources. In addition, this section evaluates the proposed project's effect on cultural resources within the project area.

3.6.2 Regulatory Framework

Section 106 of the National Historic Preservation Act (NHPA) of 1966 requires federal agencies to consider the effects of their undertakings on properties listed or potentially eligible for listing on the National Register of Historic Places. All actions affecting the parks' cultural resources must comply with this legislation.

NEPA requires analysis of the impacts of federal actions on the human environment (the natural and physical environment and its relationship with human cultural); and directs that these important historical, cultural, and natural aspects of our national heritage be preserved.

This section analyzes the context, duration, and intensity of impacts related to cultural resources, as required by Director's Order 12, Conservation Planning, Environmental Impact Analysis and Decision Making.

3.6.3 Affected Environment

The Section 106 Review is being completed under stipulation III.C of the Memorandum of Agreement (MOA) between GGNRA and the California State Historic Preservation officer regarding the Marin Headlands and Fort Baker TIMP. The MOA was signed in 2009 and defined the undertaking as the Marin Headlands and Fort Baker TIMP, which includes road improvements within the Forts Baker, Barry, and Cronkhite National Register District. The MOA gives GGNRA the authority to internally review additional effects of Marin Headlands roadwork found not to exceed the no adverse effect level under Section 106. The Area of Potential Effect (APE) for this project was defined according to the MOA. "The APE for the Undertaking includes an indirect area of effect, which consists of the entire Historic District, and a direct area of effect, which includes roadways, trails, and natural resource mitigation/enhancement sites."[9] The MOA defines roadways, trails, and natural resource mitigation/enhancement sites as:

1. A 20-foot corridor from the edges of the roads and parking areas involved in the Undertaking; in areas where contributing resources begin within the 20-foot zone and extend beyond that, the area of potential effect expands to encompass the entire feature.
2. A 20-foot corridor on either side of trails involved in the Undertaking.
3. The specific sites (polygons) for natural resource mitigation/enhancements for the Undertaking.

The following two documents served as the primary sources for the following description of cultural resources in the APE; Cultural Landscape Report (CLR) for Fort Baker (2005) and the Historic Road Characterization Study, Supplemental (HRCSS). The HRCSS was prepared specifically for the Marin Headlands Roads project to identify historic roads that could be affected by the proposed roadwork. No prehistoric or historic archaeological sites have been identified in the project area.[10]

Forts Baker, Barry, and Cronkhite Historic District. The project area is located within the boundary of Fort Baker in Marin County. Fort Baker is a part of the Forts Baker, Barry, and Cronkhite Historic District (Historic District). The Historic District includes 2,279 acres and was listed on the National Register of Historic (NRHP) in 1973. The three forts have "contiguous interior boundaries and common roads and utility systems."[11] The significance of the forts is derived from their coastal defense history. Contributing features to the Historic District at Fort Baker include 149 buildings and structures. Building types include residential and utilitarian. Structures include coastal fortifications,

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9 Office of Historic Preservation, Department of Parks and Recreation, *Memorandum of Agreement between Golden Gate National Recreation Area and the California State Historic Preservation Officer regarding the Marin Headlands and Ft. Baker Transportation Infrastructure and Management Project*. 2009, page 3.

10 PBS&J, *Draft Alexander Avenue Planning Study: FHWA Project CA PRA GOGA 99(2)*, March 25, 2011, page 61.

11 Lile, Thomas, *National Register of Historic Places Inventory – Nomination Form for Forts Baker, Barry and Cronkhite*, 1973.

batteries, seawall, breakwaters, bulkheads, wharfs, concrete reservoirs, steel water tanks, pump houses, roads, tunnels, retaining walls, and dry masonry riprap. The HRCSS was prepared to provide more detail on the character-defining features of specific road segments within the Historic District including Alexander Avenue. Contributing structures to the Historic District in the project area include Alexander Avenue, Bunker Road, and Danes Drive/Fort Baker-Barry Tunnel. These structures are described below.

Alexander Avenue. Alexander Avenue, also known as the Sausalito Lateral, is a contributing structure to the Historic District. It was built in 1939 by the Works Progress Administration to connect the harbor area in Sausalito with US 101 and the Golden Gate Bridge approach. The character-defining features of Alexander Avenue include:

- The road alignment
- Its role as a connector between US 101 and Sausalito
- Extensive cut and fill grading
- Exposed rock faces
- Light fixtures in the same palette as the Golden Gate Bridge
- White post and timber railing along the road edge
- Distant vistas (a.k.a. views)
- Paved shoulders

The HRCSS notes the "contemporary metal fencing on downhill side", but it is not listed as a character-defining feature. Additionally, the CLR lists chain link fences under non-historic small-scale features.[12]

Bunker Road East/Alexander Avenue Overpass. In the HRCSS there is a Bunker Road and a Bunker Road East. Bunker Road was originally a one-lane route that "was the only east-west road connection on the reserve and kept communications and supplies flowing between the two forts."[13] Bunker Road East is the portion from the Baker-Barry Tunnel east to Murray Circle. It was originally constructed in 1916 with various modifications over the years including in the 1930s when the overpass was built to accommodate Alexander Avenue and the 1995 realignment of Bunker with Danes. The arch over Bunker Road East that supports Alexander Avenue is in the APE. The character-defining features of Bunker Road East Avenue include:

- Roadbed alignment, descent into Fort Baker
- Road width and soft shoulders until closer to Fort Baker
- Relationship of tree massing to the road near the Fort Baker arrival

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[12] National Park Service. *Cultural Landscape Report for Fort Baker*. July 2005. Page 42.

[13] Feierabend, Carey, *Historic Road Characterization Study, Supplemental Work: Marin Headlands, Golden Gate National Recreation Area*, April 2004, page 15.

- Stone retaining wall on south side, at Alexander Avenue overpass
- Use of concrete pavement (under existing asphalt overlay)
- Concrete waterway, and concrete curb and gutter near entry to Fort Baker
- View through the under pass of Alexander Avenue

Danes Drive/Fort Baker-Barry Tunnel. The Fort Baker-Barry Tunnel was constructed in 1918 to improve access between Forts Baker and Barry. It eliminated the need to cross Conzelman Road to travel between the two forts. The tunnel was cut through serpentine rock for 2,363 linear feet and lined with 10-foot by 10-foot timbers. Originally designed for horses, carts, and early motor vehicles the tunnel was quite narrow. Improvements were needed between 1935 and 1937 at which time it was widened and lined with board-finish concrete with adjoining abutments. Danes Drive is a short spur constructed c.1939 to connect Alexander Avenue and the Fort Baker-Barry Tunnel. While Danes Drive has not been previously studied individually it is considered a feature of both Alexander Avenue and the Fort Baker-Barry Tunnel. As such it is considered a historic road by NPS. [14]

3.6.4 Methodology

Regulations for implementing NEPA (42 USC §4321, et seq.) and NHPA (16 USC §470 et seq.) require the analysis of the effects of proposed actions on important cultural resources. Both acts have different sets of definitions for assessing effects on cultural resources; therefore, the following impact analyses are designed to comply with the requirements of both NEPA and NHPA Section 106.

In accordance with the Advisory Council on Historic Preservation's regulations implementing NHPA Section 106 (36 CFR Part 800, Protection of Historic Properties), impacts to cultural resources also were identified and evaluated by: 1) determining the area of potential effects; 2) identifying cultural resources present in the area of potential effects that are either listed in or eligible to be listed on the NRHP; 3) applying the criteria of adverse effect to affected, National Register-eligible or listed cultural resources; and 4) considering ways to avoid, minimize, or mitigate adverse effects.

According to the Advisory Council's regulations, a determination of either *adverse effect* or *no adverse effect* must be made for affected National Register listed or eligible cultural resources. An adverse effect occurs whenever an impact directly or indirectly alters any characteristic of a cultural resource that qualifies it for inclusion in the National Register. For example, the impact diminishes the integrity of its location, design, setting, materials, workmanship, feeling, or association, or it diminishes the extent to which a resource retains its historic appearance. Adverse effects also include reasonably foreseeable effects caused by the alternatives that would occur later in time, be farther removed in distance, or be cumulative (36 CFR Part 800.5). A determination of *no adverse effect* means there is an effect, but the effect would not diminish the characteristics of the cultural resource that qualify it for inclusion in the National Register.

[14] Personal Communication with Paul Scolari of NPS, September 20, 2011.

The Council on Environmental Quality regulations and NPS policies require a discussion of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, such as reducing the intensity of an impact from major to moderate or minor. Any reduction in impact intensity due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced.

Cultural resources are non-renewable resources, and adverse effects generally consume, diminish, or destroy the original historic materials or form, resulting in a loss in the integrity of the resource that can never be recovered. Therefore, although actions determined to have an adverse effect under Section 106 may be mitigated, the effect remains adverse.

NPS has assessed both direct impacts and indirect impacts. The analysis of environmental impacts considers the context, duration, intensity, and type of impact, as described previously.

The following impact intensities have been defined under NEPA:

- *Negligible:* The impact would be at the lowest levels of detection: barely perceptible and not measurable.
- *Minor:* The impact either would not affect or only slightly affect the character defining features of a structure or building listed on or eligible for listing on the National Register of Historic Places. Minor beneficial effects would involve the stabilization/ preservation of character defining features in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.
- *Moderate:* For adverse impacts, the impact would alter a character-defining feature(s) of the structure or building but would not diminish the integrity of the resource to the extent that its listing on or eligibility for listing on the National Register of Historic Places would be jeopardized. Moderate beneficial impacts would involve the rehabilitation of a structure or building in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.
- *Major:* Major adverse impacts would alter a character-defining feature(s) of the structure or building, diminishing the integrity of the resource to the extent that it was no longer eligible for listing on the National Register of Historic Places. Major beneficial impacts would involve restoration of a structure or building in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Undertakings described as having a "Negligible" impact under NEPA would be described as "No Historic Properties Affected" under Section 106. Undertakings described as having a "Minor" impact under NEPA would be described as "No Adverse Effect" under Section 106. Undertakings described as having a "Moderate" or "Major" impact under NEPA could be described as having an "Adverse Effect" under Section 106.

3.6.5 Alternative A: No Action Alternative

For Alternative A, no improvements would be made to Alexander Avenue, Bunker Road East/Alexander Avenue Overpass, or Danes Road/Fort Baker-Barry Tunnel. As such there would be no direct or indirect impacts; therefore, no potential for adverse impacts to Alexander Avenue, Bunker Road East/Alexander Avenue Overpass, or Danes Road/Fort Baker-Barry Tunnel as contributing structures to the Forts Baker, Barry, and Cronkhite Historic District.

Cumulative Effects. The context for cumulative effects includes the 19 road projects in the TIMP, which involve roads, trails, and parking areas. While individual roads are called out for many of the projects, there are three broad project titles: Fort Cronkhite internal roads, Fort Barry internal roads, and Fort Baker roads. Therefore, any and all roads could be modified in the Historic District under the Plan. The HRCSS inventories 16 roads as Fort Cronkhite Roads. However, under Alternative A there would be no adverse impacts to a resource therefore no cumulative effect would occur.

Conclusion. Implementation of Alternative A would not result in any direct or indirect impacts. Therefore, this alternative would have no effect on cultural resources within the project area.

3.6.6 Alternative B: 16-Foot Catchment Alternative

As described above there are eight character-defining features for Alexander Avenue. Implementation of Alternative B would alter some of these features. The following discusses whether or not a feature would be altered and how.

- Road alignment – no change.
- Role as a connector between Highway 101 and Sausalito – no change.
- Extensive cut and fill grading – the cut and road would be widened, additional excavation performed, and a catchment area would be built. Therefore, a degree of the narrow quality of the cut would be lost and the angle of the new cut would be slightly different than the existing.
- Exposed rock faces – widening would alter the exposed rock faces if rockfall mesh or other engineering feature covers the rock face or if the rock face would be visually altered due to a different method of excavation. The new slopes would be at a slightly different angle as well.
- Light fixtures in the same palette as the Golden Gate Bridge – the light fixtures (both cobra and bridge style) would need to be relocated in order to accommodate the widening, but they would not be removed from the site.
- White post and timber railing along the road edge – the railing would also be relocated to accommodate the widening, but would not be removed from the site. They would be relocated, restored, and reconstructed/strengthened, but would not be substantially altered visually.

- Distant vistas (a.k.a. views) – the views from the road would not be altered; no structures are proposed that would block views. There is limited visibility of the project area from the surrounding areas due to the cut and the curvilinear nature of the road. Views from the surrounding area would not be substantially altered.
- Paved shoulders – the road would be widened, but the new construction would include paved shoulders.

Alternative B would have local, minor, and adverse effects through modification to character-defining features of Alexander Avenue. If the rock face is cut so as to closely match the existing slope and roughness of the existing cut there would be a minor effect. The changes would be detectable, but would not compromise the significance of Alexander Avenue. The addition of a retaining wall above the Bunker Road East/Alexander Avenue Overpass to accommodate the widening of Alexander Avenue would not be substantial and would not compromise the character defining features. The modifications to Alexander Avenue, the Bunker Road East/Alexander Avenue Overpass, and Danes Drive/Baker-Barry Tunnel would not be substantial enough to affect the Historic District's eligibility to the NRHP. These features would retain enough integrity to remain contributing features to the Historic District. Mitigation measures have been included to reduce possible adverse effects to the existing cut or to the Bunker Road East/Alexander Avenue Overpass from the widening of Alexander Avenue. With implementation of Alternative B, the proposed undertaking would have no adverse effect under Section 106.

In addition, there are no known archaeological resources on or in the vicinity of the project site. There are no recorded instances of human remains occurring within the project site or in the immediate vicinity. However while highly unlikely, it is possible that earth-disturbing construction activities could encounter and damage these types of cultural resources. Implementation of Mitigation Measures CR-1 and CR-2, discussed in detail under Section 3.6.9, Mitigation Measures, would reduce these impacts to a negligible level.

Cumulative Effects. The context for cumulative effects includes the 19 road projects in the TIMP, which involve roads, trails, and parking areas. While individual roads are called out for many of the projects, there are three broad project titles: Fort Cronkhite internal roads, Fort Barry internal roads, and Fort Baker roads. Therefore, any and all roads could be modified in the Historic District under the Plan. Alternative B would not diminish the integrity of Alexander Avenue such that it would no longer contribute to the Historic District; therefore, no cumulative effect would occur.

Conclusion. Alternative B would result in direct, long-term, local, minor, adverse impacts to cultural and archaeological resources; however, these impacts would not affect the Historic District's eligibility or the eligibility of Alexander Avenue or the Bunker Road East/Alexander Avenue Overpass as contributing features to the Historic District.

3.6.7 Alternative C: 5-Foot Catchment Alternative

Alternative C would alter some of the eight character-defining features of Alexander Avenue. These alterations, and their potential effects, are described below:

- Road alignment – no change.
- Role as a connector between US 101 and Sausalito – no change.
- Extensive cut and fill grading –the cut would not be filled in, the road would be widened, but excavation of the east slope would be less than under Alternative B. The narrow character of the cut would be maintained due to the smaller excavation and angle of the cut.
- Exposed rock faces – widening would alter the exposed rock faces through the application of rockfall mesh. The new slopes would be at a slightly different angle as well.
- Light fixtures in the same palette as the Golden Gate Bridge – the light fixtures (both the cobra and bridge style) would need to be relocated in order to accommodate the widening, but they would not be removed from the site.
- White post and timber railing along the road edge – the railings would also be relocated to accommodate the widening, but would not be removed from the site. They would be relocated, restored, and reconstructed/strengthened, but would not be substantially altered visually.
- Distant vistas (a.k.a. views) – the views from the road would not be altered; no structures are proposed that would block views. There is limited visibility of the project area from the surrounding areas due to the cut and the curvilinear nature of the road. Views from the surrounding area would not be substantially altered.
- Paved shoulders – the road would be widened, but the new construction would include paved shoulders.

Alternative C would have a local, major, and adverse effect by modifying character-defining features of Alexander Avenue. Unlike Alternative B, the permanent installation of rockfall mesh included in Alternative C over the entire rock face would be considered a major effect because it would obscure one of the character-defining features of Alexander Avenue. The modifications to Alexander Avenue would affect the Historic District's eligibility to the NRHP due to a loss of integrity. With implementation of Alternative C, the proposed undertaking would have an adverse effect under Section 106.

Similar to Alternative B, Alternative C would be subject to Mitigation Measures CR-1 through CR-4, in order to reduce the potential or adverse impacts to unknown archaeological resources, human remains, and cultural resources.

Cumulative Effects. The context for cumulative effects includes the 19 road projects in the TIMP, which involve roads, trails, and parking areas. While individual roads are called out for many of the projects, there are three broad project titles: Fort Cronkhite internal roads, Fort Barry internal roads, and Fort Baker roads. Therefore, any and all roads could be modified in the Historic District under the

Plan. The HRCSS inventories 16 roads as discusses the Fort Cronkhite Roads. Alternative C would diminish the integrity of Alexander Avenue such that it would no longer contribute to the Historic District; therefore, cumulative effects would be major, long term, and adverse.

Conclusion. Implementation of Alternative C would result in direct, long-term, major, adverse impacts related to archaeological and cultural resources. Alternative C would have an adverse effect on both the Historic District's eligibility and the eligibility of Alexander Avenue as contributing features to the Historic District.

3.6.8 Alternative D: 8-Foot Catchment Alternative

Alternative D would alter some of the eight character-defining features of Alexander Avenue. These alterations, and their potential effects, are described below:

- Road alignment – no change.
- Role as a connector between US 101 and Sausalito – no change.
- Extensive cut and fill grading – the cut and road would be widened and more excavation performed. Further, the angle of the new cut would be slightly different than the existing cut slope and a catchment area would be built at the toe of the cut slope. Therefore, a degree of the narrow quality of the cut would be lost; however, to a lesser degree than Alternative B.
- Exposed rock faces – widening would alter the exposed rock faces. The new slopes would be at a slightly different angle as well. However, unlike Alternative C, Alternative D would not cover the exposed rock face with rockfall mesh.
- Light fixtures in the same palette as the Golden Gate Bridge – the light fixtures (both the cobra and bridge style) would need to be relocated in order to accommodate the widening, but they would not be removed from the site.
- White post and timber railing along the road edge – the railings would also be relocated to accommodate the widening, but would not be removed from the site. They would be relocated, restored, and reconstructed/strengthened, but would not be substantially altered visually.
- Distant vistas (a.k.a. views) – the views from the road would not be altered; no structures are proposed that would block views. There is limited visibility of the project area from the surrounding areas due to the cut and the curvilinear nature of the road. Views from the surrounding area would not be substantially altered.
- Paved shoulders – the road would be widened, but the new construction would include paved shoulders.

If the rock face is cut so as to closely match the existing slope and roughness of the existing cut there would be a minor effect. Alternative D would not install rockfall mesh over the exposed rock face of the east slope; however, a temporary concrete barrier would be installed along southbound Alexander Avenue between the roadway and the rockfall catchment ditch. The temporary barrier would not alter the appearance or degrade the exposed rock face, or any of the eight character-defining features

identified above. In addition, adherence to Mitigation Measures CR-3 would minimize potential degradation of identified cultural resources from implementation of Alternative D.

Overall, the changes associated with Alternative D would be detectable, but would not compromise the significance of Alexander Avenue. The addition of a retaining wall above the Bunker Road East/Alexander Avenue Overpass to accommodate the widening of Alexander Avenue would not be substantial and would not compromise the character defining features. The modifications to Alexander Avenue, the Bunker Road East/Alexander Avenue Overpass, and Danes Drive/Baker-Barry Tunnel would not be substantial enough to affect the Historic District's eligibility to the NRHP. These features would retain enough integrity to remain contributing features to the Historic District. Mitigation measures have been included to reduce possible adverse effects to the existing cut or to the Bunker Road East/Alexander Avenue Overpass from the widening of Alexander Avenue. With the implementation of Alternative D, the proposed undertaking would have no adverse effect under Section 106.

As described for the previous two action alternatives, there are no archaeological resources or recorded instances of human remains occurring on or in the vicinity of the project site. However while highly unlikely, it is possible that earth-disturbing construction activities could encounter and damage these types of cultural resources. Implementation of Mitigation Measures CR-1 and CR-2, discussed in detail under Section 3.6.9, Mitigation Measures, would reduce these impacts to a negligible level.

Cumulative Effects. The context for cumulative effects includes the 19 road projects in the TIMP, which involve roads, trails, and parking areas. While individual roads are called out for many of the projects, there are three broad project titles: Fort Cronkhite internal roads, Fort Barry internal roads, and Fort Baker roads. Therefore, any and all roads could be modified in the Historic District under the Plan. Alternative D would not diminish the integrity of Alexander Avenue such that it would no longer contribute to the Historic District; therefore, no cumulative effect would occur.

Conclusion. Implementation of Alternative D would result in direct, local, long-term, minor, adverse impacts related to archaeological and cultural resources. However, these impacts would not affect the Historic District's eligibility or the eligibility of Alexander Avenue or the Bunker Road East/Alexander Avenue Overpass as contributing features to the Historic District.

3.6.9 Mitigation Measures

The following mitigation measures would minimize the potential for adverse effects related to the damage and alteration of cultural resources, archaeological resources, and human remains.

CR-1 *Discovery Provisions*. In the event that previously unknown cultural resources are encountered during project construction by anyone, they shall be treated in accordance with 36 CFR 800.13 (Protection of Historic Properties: Post-review discoveries). The archeological resource shall be assessed for its eligibility for listing on the NRHP in consultation with the SHPO and the Federated Indians of Graton Rancheria (if it is an indigenous archaeological site) and a determination of the project effects on the property shall be made. If the site shall be adversely affected, a treatment plan shall

also be prepared, as needed, during the assessment of the site's significance. Assessment of inadvertent discoveries may require archaeological excavations or archival research to determine resource significance. Treatment plans shall fully evaluate avoidance, project redesign, and data recovery alternatives before outlining actions proposed to resolve adverse effects.

CR-2 *Discovery Provision*. In the event that human remains are discovered, work shall cease immediately in the area of the find and the project manager/site supervisor shall notify the appropriate CDPR and NPS personnel. Protocols under federal law shall apply for discoveries on federal land. For discoveries of native human remains on state land, these would be handled by CDPR in accordance with state burial laws. The find shall be secured and protected in place. The Marin County coroner shall be notified in accordance with §7050.5 of the California Health and Safety Code, and the Native American Heritage Commission (NAHC) shall be notified within 24 hours of the discovery if the coroner determines that the remains are Native American. If a determination finds that the remains are Native American and that no further coroner investigation of the cause of death is required, they shall be treated in accordance with the Native American Graves Protection and Repatriation Regulations at 43 CFR 10.4 (Inadvertent Discoveries).

CR-3 *Design Requirements*. If rockfall mesh is installed it shall be designed to be as visually unobtrusive as possible. Further, NPS cultural resources staff shall review and approve: 1) the design of the rockfall mesh (if installed); 2) the design of the temporary rockfall barrier (providing input, in particular, on wall type/style and color); and 3) the design of the retaining wall proposed to be built above the Bunker Road arch tunnel.

CR-4 *Avoid Adverse Effects to Cultural Resources*. Implementation of Alternative C would result in an adverse effect on both the Historic District's eligibility and the eligibility of Alexander Avenue as contributing features to the Historic District under Section 106. Therefore, Alternative C shall not be selected or implemented as the agency preferred alternative.

3.7 Air Quality

3.7.1 Introduction

This section summarizes the existing air quality conditions in the project area, describes the applicable regulatory framework intended to minimize short-term and long-term air pollution, and evaluates the proposed project's affect on air quality both onsite and in the surrounding area. In addition, this section identifies the local climate and meteorological conditions that influence the project site. The proposed improvements would not move traffic substantially closer to any sensitive receptors because the proposed project would involve reconfiguration of the existing Alexander Avenue/Danes Drive intersection and minor roadway widening of Alexander Avenue to the east (the proposed improvements would extend the edge of the roadway between 4 and 13 feet). The proposed project would not result in

increased traffic at the intersection or operation of any major stationary sources of criteria pollutants, odors, or toxic air pollutants. Consequently, the proposed project would not result in long-term operational air quality effects; therefore, the analysis presented below focuses on short-term impacts to air quality during construction.

3.7.2 Regulatory Framework

Ambient air quality standards were developed to protect the public health and welfare. Individuals or groups that would be especially reactive to criteria pollutants are considered sensitive receptors, such as children, the elderly, individuals susceptible to respiratory distress, and those who are acutely or chronically ill. These standards specify the concentration of pollutants the public can be exposed to without experiencing adverse health effects. National and State standards are reviewed and updated periodically based on new health studies.

The U.S. Environmental Protection Agency (EPA) established the federal standards after the passage of the Clean Air Act of 1970. EPA established national area designations for seven criteria pollutants. These pollutants include CO, ozone, NOx, SO_2, lead, PM_{10}, and $PM_{2.5}$. Nationally, an area considered to have air quality as good as or better than the national ambient air quality standards as defined in the Clean Air Act is designated attainment; any area that exceeds ambient air quality standards is designated as non-attainment; and an area that cannot be classified on the basis of available data as meeting or not meeting the national primary or secondary ambient air quality standard is designated unclassified.

California ambient standards tend to be at least as protective as national ambient standards and are often more stringent. Based on these standards (attainment, nonattainment, or unclassified), regional areas such as the San Francisco Bay Area Air Basin (SFBAAB) are given an air quality status "label" by the federal and state regulatory agencies for planning purposes. Although the California Clean Air Act was not enacted until 1988, State ambient air quality standards were established in 1969. The California Air Resource Board (ARB) makes State area designations for ten ambient air pollutants commonly referred to as "criteria pollutants" (an air pollutant for which acceptable levels of exposure can be determined and for which an ambient air quality standard has been set): ozone, particulate matter 10 microns or less in diameter (PM_{10}), particulate matter 2.5 microns or less in diameter ($PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NOx), sulfur dioxide (SO_2), sulfates, lead, hydrogen sulfide, and visibility reducing particles (VRPs). A pollutant is designated in attainment if the State standard for that pollutant was not violated in the area during a three-year period. Conversely, a pollutant is designated non-attainment if there was at least one violation of a State standard for that pollutant in the area. Unclassified means the data is incomplete and a designation of attainment or non-attainment is not supportable.

At the local level, the Bay Area Air Quality Management District (BAAQMD) is responsible for air quality conditions in the SFBAAB. The district seeks to attain and maintain air quality through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. The district has adopted several air quality plans to achieve State and federal air quality standards in compliance with the requirements of the Clean Air Act as

amended and the California Clean Air Act. These plans, the most recent of which is the 2010 Clean Air Plan, present comprehensive strategies to reduce air pollutant emissions from stationary, area, mobile, and indirect sources.[15] To achieve the goals established by the 2010 Clean Air Plan, BAAQMD employs multiple strategies, such adopting of guidelines to assist lead agencies in evaluating air quality impacts of projects and plans proposed in the SFBAAB.

3.7.3 Affected Environment

Climate. California and Marin County experience profound seasonal changes in weather. This seasonal variation in weather conditions produces the pattern of wet winters and arid summers that characterize a Mediterranean climate. Marin County is wedge shaped, bounded on the west by the Pacific Ocean, on the east by the San Pablo Bay, on the south by the Golden Gate, and on the north by the Petaluma Gap. This project is located on the San Francisco Bay side of the county.

Temperature. Areas along the west coast of Marin County are usually subject to cool marine air. In the summer months, the marine air is cooled as it passes over the offshore upwelling region, and forms a fog layer along the coast. In the winter, proximity to the ocean keeps the coastal regions relatively warm. Temperatures do not vary much over the year at these coastal areas: high 50s in the winter and low 60s in the summer. The warmest months are September and October, which are in the mid to high 60s. The eastern side of Marin County has warmer weather and less fog because it is farther from the ocean.[16]

Precipitation. The San Francisco Bay Area climate is characterized by moderately wet winters and dry summers. Winter rains (December through March) account for about 75 percent of the average annual rainfall; about 90 percent of the annual total rainfall is received in the November-April period. The mountainous terrain in Marin County has higher rainfall amounts than most parts of the Bay Area (the southern Santa Cruz Mountains report higher rainfall amounts).

Local Air Quality. The project site is within the SFBAAB, which is comprised of a single district, the BAAQMD, and consists of Napa, Marin, San Francisco, Contra Costa, Alameda, San Mateo, and Santa Clara counties, the southern portion of Sonoma County, and the western portion of Solano County. According to ARB, the SFBAAB is a non-attainment area for ozone, PM_{10}, and $PM_{2.5}$, under State Ambient Air Quality Standards.[17] CO, NOx, SO_2, sulfates, and lead are all designated attainment and hydrogen sulfide and VRP levels have been designated as unclassified.

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[15] BAAQMD, *Bay Area 2010 Clean Air Plan – Executive Summary*, website: http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/Plans/2010%20Clean%20Air%20Plan/Executive%20Summary%20of%20Bay%20Area%202010%20CAP.ashx, accessed June 13, 2011.

[16] Bay Area Air Quality Management District, Climate Physiography, and Air Pollution Potential – Bay Area and Its Subregions (Referenced by County), website: http://hank.baaqmd.gov/dst/papers/bay_area_climate.pdf, accessed June 9, 2011.

[17] California Air Resources Board, Final Regulation Order, Area Designations for State Ambient Air Quality Standards, August 26, 2010, website: http://www.arb.ca.gov/regact/2010/area10/areafrodc.pdf, accessed June 9, 2011.

At the national level, the SFBAAB is a non-attainment area for ozone and $PM_{2.5}$. CO, SO_2, and lead are designated as in attainment for national standards. NOx and PM_{10} are designated as unclassified.

Sensitive Receptors. The closest sensitive receptors are the fitness center and hotel lodges at Fort Baker. The closest sensitive use is the fitness center and pool which is approximately 450 feet east of the project area. The closest hotel lodge is approximately 715 feet east of the project area.

3.7.4 Methodology

This air quality analysis includes a general discussion of potential short-term impacts on air quality resulting from construction of the proposed project. Short-term construction-generated criteria air pollutant and precursor emissions (e.g., reactive organic gases [ROG], NOx, PM_{10}, and $PM_{2.5}$) are estimated using the Roadway Construction Emissions Model (Version 6.3.2), as recommended by BAAQMD. For this analysis, short-term impacts would be associated with construction and excavation activities. The model assumes that under all three action alternatives excavated material would be transported offsite over a period of 60 days, using trucks with a haul capacity of 20 cubic yards (CY). To reduce the disposal of park geologic resources, as well as reduce the project impacts to air quality, GGNRA anticipates being able to utilize on the order of 10,000 CY of the excavated roadcut material on projects within 10 miles driving distance from the project site. The remainder of the material is anticipated to require disposal outside of the park and, therefore, the model assumes the default haul distance of 30 miles roundtrip for excavated material in excess of 10,000 CY. For purposes of the air quality model, a weighted average of the two haul distances and associated amount of excavated material was used as the round trip haul distance input value. This assumption is explained further in the discussion of alternatives provided below. Alternative B would result in the excavation of approximately 26,500 CY of material. Alternative C would result in the excavation of approximately 18,000 CY of material. Alternative D would result in the excavation of approximately 21,600 CY of material.

Long-term impacts would be based on changes in mobile source emissions on a local scale such as traffic levels of service at individual locations. However, the proposed project would not lead to an increase in traffic at the Alexander Avenue/Danes Drive intersection nor would it relocate traffic sources substantially closer to any sensitive receptors. In addition, the proposed project would not result in operation of any major stationary sources of criteria pollutants, odors, or toxic air pollutants. Consequently, the proposed project would not result in long-term, operational air quality effects.

The following intensity levels were selected based on BAAQMD-recommended thresholds for determining impacts during project construction. More specifically, according to the BAAQMD CEQA Guidelines, projects that would generate 54 pounds per day of ROG, NOx, or $PM_{2.5}$, or 82 pounds per day of PM_{10} from construction exhaust would result in a significant impact under CEQA.[18] In addition, the BAAQMD CEQA Guidelines indicate that projects would have a significant impact related to fugitive dust if the recommended best management practices are not implemented. The following are definitions of the impact intensities used in the analysis below:

[18] BAAQMD, *CEQA Air Quality Guidelines*, May 2011.

- *Negligible:* Construction of the project would not require the use of heavy construction equipment.
- *Minor:* Emissions from construction activities would result in less than 27 pounds per day of ROG, NOx, or $PM_{2.5}$, and less than 41 pounds per day of PM_{10}. The project would also implement best management practices for fugitive dust.
- *Moderate*: Emissions from construction activities would result in 27 to 53 pounds per day of ROG, NOx, or $PM_{2.5}$, or 41 to 79 pounds per day of PM_{10}. The project would also implement best management practices for fugitive dust.
- *Major:* Emissions from construction activities would result in 54 pounds per day or more of ROG, NOx, or $PM_{2.5}$, or 80 pounds per day or more of PM_{10}, or the project would not implement best management practices for fugitive dust.

3.7.5 Alternative A: No Action Alternative

There would be no construction activities required for implementation of Alternative A. As a result, this alternative would have no effect on short-term air quality.

Cumulative Effects. Alternative A would not generate construction-related air pollution that could contribute to cumulative, short-term air pollution from construction activities associated with the TIMP or the Fort Baker Plan.

Conclusion. Alternative A would have no effect on short-term air quality in the project area or surrounding region.

3.7.6 Alternative B: 16-Foot Catchment Alternative

Implementation of Alternative B would require construction activities to widen Alexander Avenue and to reconfigure the Alexander Avenue/Danes Drive intersection. Under this alternative, the east slope along Alexander Avenue would be excavated to allow for the construction of a 16-foot rockfall catchment ditch. Alternative B would generate exhaust emissions of ROG, NOx, PM10, and $PM_{2.5}$ from the operation of construction equipment during grading, excavation, construction, and the hauling of excavated material. Construction of Alternative B would also generate fugitive dust emissions during grading and excavation. As noted above, BAAQMD recommends quantification of construction equipment exhaust as a result of the project. Exhaust emissions are quantified below.

Exhaust Emissions. Construction equipment exhaust emissions associated with Alternative B are shown in Table 3-1. Emissions from the Alternative B were calculated using the Roadway Construction Emissions Model, based on the assumptions described above. The round trip haul distance of 26 miles was used for offsite hauling under Alternative B. This distance was determined by calculating the weighted average between the 10,000 CY of soil that would be hauled no further than 10 miles from the project site (20 miles roundtrip), and the remaining 16,500 CY which would be disposed of outside of the park and assumes the modeling default distance of a 30 mile roundtrip. Construction activities shall adhere to Mitigation Measure AQ-1 and AQ-2 (described below) in order to reduce adverse

effects related to dust and exhaust emissions. As shown in Table 3-1, Alternative B would result in minor to major and adverse emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$.

Table 3-1
Air Pollutant Emissions from Alternative B Construction Activities (lbs/day)

Construction Phase/Activity	ROG	NO_x	PM_{10}	$PM_{2.5}$
Grubbing/Land Clearing	3.7	31.0	41.3	9.5
Grading/Excavation	7.3	55.7	42.5	10.6
Drainage/Utilities/Sub-Grade	3.6	26.9	41.4	9.6
Paving	2.3	12.8	1.1	1.0
Maximum Emissions	**7.3**	**55.7**	**42.5**	**10.6**

Source: Atkins, 2011.

Cumulative Effects. The transportation improvements considered for the proposed project were included in both the Fort Baker Plan EIS ROD as an Offsite Transportation Enhancement measure and the FEIS for the TIMP. The TIMP EIS determined that, based on the size of the GGNRA Marin Headlands area and climatic conditions, there would be no cumulative short-term air quality impacts associated with construction activities. Further, none of the past, present, or future projects within the GGNRA Marin Headlands area would be expected to change the average daily traffic volumes or level of service within the study area. As such, the TIMP EIS found that there would be no cumulative, long-term air quality impacts. However, because Alternative B would result in short-term, minor to major adverse air quality effects independently, it would also result in short-term, minor to major adverse Cumulative Effects.

Conclusion. Construction of Alternative B would result in short-term, local, adverse air quality effects on a daily basis. Based on the size of the affected area and implementation of the identified mitigation measures for the control of construction-generated emissions and fugitive dust, short-term air quality effects would be minor to moderate.

3.7.7 Alternative C: 5-Foot Catchment Alternative

Implementation of Alternative C would require construction activities to widen Alexander Avenue and to reconfigure the Alexander Avenue/Danes Drive intersection. Under this alternative, the east slope along Alexander Avenue would be excavated to allow for the construction of a 5-foot rockfall catchment ditch compared to the 16-foot rockfall catchment ditch proposed for Alternative B. The project would generate exhaust emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$ from the operation of construction equipment during grading, excavation, construction, and the hauling of excavated material. The project would also generate fugitive dust emissions during grading and excavation.

Exhaust Emissions. Construction equipment exhaust emissions associated with Alternative Care shown in Table 3-2. Emissions from the proposed project were calculated using the Roadway Construction Emissions Model. The round trip haul distance of 24 miles was used for offsite hauling under Alternative C. This distance was determined by calculating the weighted average between the 10,000 CY of that would be hauled no further than 10 miles from the project site (20 miles roundtrip), and the remaining 8,000 CY which would be disposed of outside of the park and assumes the modeling default

distance of 30 miles roundtrip. As shown in Table 3-2, Alternative C would result in minor to moderate and adverse emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$. Mitigation Measure AQ-1 and AQ-2 (described below) would reduce adverse effects related to dust and exhaust emissions.

Table 3-2
Air Pollutant Emissions from Alternative C Activities (lbs/day)

Construction Phase/Activity	ROG	NO_x	PM_{10}	$PM_{2.5}$
Grubbing/Land Clearing	3.7	31.0	41.3	9.5
Grading/Excavation	6.6	49.9	42.3	10.4
Drainage/Utilities/Sub-Grade	3.6	26.9	41.4	9.6
Paving	2.3	12.8	1.1	1.0
Maximum Emissions	**6.6**	**49.9**	**42.3**	**10.4**

Source: Atkins, 2011.

Cumulative Effects. The transportation improvements considered for the proposed project were included in both the Fort Baker Plan EIS ROD as an Offsite Transportation Enhancement measure and the FEIS for the TIMP. The TIMP EIS determined that based on the size of the GGNRA Marin Headlands area and climatic conditions; there would be no cumulative short-term air quality impacts associated with construction activities. Further, none of the past, present, or future projects within the GGNRA Marin Headlands area would be expected to change the average daily traffic volumes or LOS within the project area. As such, the TIMP EIS found that there would be no cumulative, long-term air quality impacts. However, because Alternative C would result in short-term, minor to moderate and adverse air quality effects independently, it would also result in short-term, moderate, adverse cumulative effects.

Conclusion. Alternative C would result in short-term, local, adverse air quality effects a daily basis; however, based on the size of the affected area and implementation of the identified mitigation measures for the control of construction-generated emissions and fugitive dust, short-term air quality effects would be minor to moderate.

3.7.8 Alternative D: 8-Foot Catchment Alternative

The construction activities and project components of Alternative D are similar to those described for the previous two action alternatives. However, Alternative D would excavate the east slope along Alexander Avenue to allow for the construction of an 8-foot rockfall catchment ditch as opposed to a 16-foot or 5-foot rockfall catchment ditch as proposed under Alternative B and Alternative C, respectively. The project would generate exhaust emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$ from the operation of construction equipment during grading, excavation, construction, and the hauling of excavated material. The project would also generate fugitive dust emissions during grading and excavation.

Exhaust Emissions. Construction equipment exhaust emissions associated with Alternative D are shown in Figure 3-3. Emissions from the proposed project were calculated using the Roadway Construction Emissions Model. The round trip haul distance of 25 miles was used for offsite hauling under Alternative D. This distance was determined by calculating the weighted average between the

10,000 CY of soil that would be hauled no further than 10 miles from the project site (20 miles roundtrip), and the remaining 11,600 CY which would be disposed of outside of the park and assumes the modeling default distance of 30 miles roundtrip. As shown in Table 3-3, Alternative D would result in minor to moderate and adverse emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$. Mitigation Measure AQ-1 and AQ-2 (described below) would reduce adverse effects related to dust and exhaust emissions.

Table 3-3
Air Pollutant Emissions from Alternative D Activities (lbs/day)

Construction Phase/Activity	ROG	NO_x	PM_{10}	$PM_{2.5}$
Grubbing/Land Clearing	3.7	31.0	41.3	9.5
Grading/Excavation	6.9	52.4	42.4	10.5
Drainage/Utilities/Sub-Grade	3.6	26.9	41.4	9.6
Paving	2.3	12.8	1.1	1.0
Maximum Emissions	**6.9**	**52.4**	**42.4**	**10.5**

Source: Atkins, 2011.

Cumulative Effects. The proposed project was considered as part of the multiple roadway improvement projects analyzed in both the Fort Baker Plan EIS ROD and the TIMP EIS. The TIMP EIS determined that based on the size of the GGNRA Marin Headlands area and climatic conditions; there would be no cumulative short-term air quality impacts associated with construction activities. Further, none of the past, present, or future projects within the GGNRA Marin Headlands area would be expected to change the average daily traffic volumes or LOS within the project area. As such, the TIMP EIS found that there would be no cumulative, long-term air quality impacts. However, because Alternative D would result in short-term, minor to moderate and adverse air quality effects independently, it would also result in short-term, moderate, adverse cumulative effects.

Conclusion. Alternative D would result in short-term, local, adverse air quality effects a daily basis; however, based on the size of the affected area and implementation of the identified mitigation measures for the control of construction-generated emissions and fugitive dust, short-term air quality effects would be minor to moderate.

3.7.9 Mitigation Measures

The following two mitigation measures would minimize the construction-related adverse PM_{10} and NOx emissions:

AQ-1 *Construction Dust and Emissions Control Strategies*. To reduce particulate matter emissions during project excavation and construction phases, the project contractor(s) shall comply with the dust control strategies developed by the BAAQMD. The Project Sponsor shall include in all construction contracts the following requirements or measures:

- All exposed surfaces (such as parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.

- All haul trucks transporting soil, sand, or other loose material off site shall be covered.
- All visible mud or dirt track-out onto adjacent public roads shall 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 shall be limited to 15 miles per hour (mph).
- All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 30 seconds (as required GGNRA Vehicle Idling Standard Operating Procedures adopted by GGNRA in compliance with State of California regulations for In-Use Off-Road Diesel Vehicles [Title 13 CCR, Section 2449(d)(3)]). Clear signage shall be provided for construction workers at all access points.
- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
- Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. BAAQMD's phone number shall also be visible to ensure compliance with applicable regulations. [19]

AQ-2 Limitations on Excavated Material and Debris Removal. The construction documents shall ensure that the hauling of excavated material and construction debris shall be conducted in such a manner that the modeled air pollutant emissions (using the Roadway Construction Emissions Model) would not exceed the thresholds of significance for criteria air pollutants established by BAAQMD. Methods to achieve this standard could include use of larger haul trucks, minimization of truck trips per day, and identification of a nearby disposal site for placement of the excavated material (to reduce haul distance).

3.8 Geologic Resources, Soils, and Seismic Hazards

3.8.1 Introduction

This section describes existing geology, soil conditions, and geologic hazards including seismicity, in the project area, as well as applicable laws, regulations, and policies pertaining to park geologic resources. In addition, it evaluates short-term and long-term impacts to geology and soils associated

[19] Bay Area Air Quality Management District, *CEQA Air Quality Guidelines,* Updated May 2011, p. 9-17.

with the alternatives considered for the Alexander Avenue/Danes Drive Intersection Improvement Project.

3.8.2 Regulatory Framework

In accordance with its Management Policies 2006, NPS will preserve and protect geologic resources as integral components of park natural systems, both geologic features and processes. As stated in Section 4.8 of NPS's Management Policies 2006, the NPS will, "assess the impacts of natural processes and human-related events on geologic resources; maintain and restore the integrity of existing geologic resources; integrate geologic resource management into NPS operations and planning; and interpret geologic resources for park visitors."[20]

The California Seismic Hazards Mapping Act was created to protect the public from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and from other hazards caused by earthquakes. This act requires the state geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. The California Geological Survey has not yet completed a preliminary seismic hazards map for the western portion of the Marin Headlands.

3.8.3 Affected Environment

This section provides information on the geology and soils that occur or could occur within the project area, indentifies geologic hazards in the vicinity of the project area, and analyzes issues related to project operation including potential exposure of people and property to geologic hazards, landform alteration, and erosion. The primary source of information for this section is a Preliminary Geotechnical Investigation Report (geotechnical report) for the Alexander Avenue/Danes Drive intersection, prepared by Yeh and Associates, Inc., on August 14, 2009. In addition, information was obtained from the USGS Field Trip Guide, Geology of the Golden Gate Headlands, by Will Elder.[21]

Geologic Resources The project area is in a part of the Franciscan Complex known as the Marin Headlands Terrane. The rocks of the Franciscan Complex that underlie much of coastal Northern California were formed in the subduction zone between the Pacific Plate and the North American Plate. Franciscan rocks form the basement of the Coastal Ranges east of the San Andreas Fault. In the Bay Area the constituent rocks of Franciscan Complex range in age from 200 million to 80 million years old. The Franciscan Complex primarily consists of greywacke sandstone and argillite, with lesser amounts of greenstone (altered submarine basalt), radiolarian ribbon chert, limestone, serpentine and a variety of metamorphic rocks. These rocks have become fractured, dislocated, and blended together on a local scale to form a mixture or mélange. The Danes Drive and Alexander Avenue intersection is located near a boundary of the basalt and chert rock types. The basalt that can be observed in the rock cut south of the intersection has been weathered and altered to form what is commonly called

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[20] National Park Service, U.S. Department of Interior, *Management Policies 2006*, website: http://www.nps.gov/policy/MP2006.pdf, accessed June 7, 2011.

[21] Elder, Will, USGS Field Trip Guide, *Geology of the Golden Gate Headlands*, website: http://pubs.usgs.gov/bul/b2188/b2188ch3.pdf, accessed September 1, 2011.

greenstone. Chert is exposed along the south side of Danes Drive and west of Alexander Avenue, north of the project. The chert is bedded in 20-to 100-millimeter thick layers alternating with thinner, dark red shale layers. Where exposed along Alexander Avenue, the chert is intensely folded.

Subsurface Conditions. Exploratory borings were conducted in order to evaluate subsurface conditions as part of the geotechnical investigation. Subsurface conditions associated with the Bunker Road Arch Tunnel are characterized by approximately 7 feet of sandy gravel fill over approximately 10 feet of soft medium to high plasticity sandy clay. Beneath the engineered fill, weathered chert bedrock interlayered with clay was encountered at a depth of approximately18 feet. Hard to very hard chert bedrock was encountered at about 23 feet to the bottom of the boring at 36 feet. In addition, boring samples were taken from Alexander Avenue north and south of the intersection. Below the asphalt and aggregate base course, exploratory borings encountered chert bedrock and clayey gravel with sand. Groundwater was encountered at a depth of approximately 4 feet below grade at the time of drilling.

Seismic Hazards. The San Francisco Bay area is considered seismically active. Earthquakes are an unavoidable geologic hazard in the Marin Headlands area. The San Francisco Bay Area region contains both active and potentially active faults. The closest active faults to the Marin Headlands and Fort Baker are the San Andreas Fault, approximately 4 miles west, and the Hayward fault, approximately 19 miles east. Other active regional faults include the Rodgers Creek fault about 24 miles northeast, and the San Gregorio-Hosgri-Seal Cove fault zone about 22 miles southwest. Recent studies by the U.S. Geological Survey indicate there is a 62 percent likelihood of a Richter magnitude 6.7 or higher earthquake occurring in the Bay Area in the next 30 years. Should this occur, an earthquake on the closer faults would cause the Marin Headlands and Fort Baker to experience strong to very strong ground shaking, and an earthquake on the more distant faults would cause moderate to strong ground shaking.[22] Seismic ground shaking may trigger landslides or debris flows and may cause secondary ground failures, including liquefaction, lateral spreading, and ground lurching.

Landslide Hazards. The geologic map of southern Marin County includes the project area as an area of potential landslide.[23] Several debris-flow source areas are located on the slopes of the Marin Headlands and Fort Baker according to a map of principal debris-flow source areas in the county.[24] The only documented landslide within the project area is an active rock/debris slide at the southwest corner (west slope) of the Alexander Avenue/Danes Drive intersection. It is not within the scope of the proposed project to address the hazard associated with west slope.

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[22] Association of Bay Area Governments, *Earthquake Hazard Map for the Entire Bay Area,* 2003, website: http://www.abag.ca.gov/cgi-bin/pickmapx.pl, accessed June 13, 2011.

[23] Rice, R., J. Salem, C. Theodore, and Rudolph G. Strand, 1976, *Geology of the Lower Ross Valley, Corte Madera, Homestead Valley, Tamalpais Valley, Tennessee Valley and Adjacent Areas, Marin County, California,* on file at Golden Gate National Park, San Francisco, California.

[24] Carl M. Wentworth, Scott E. Graham, Richard J. Pike, Gregg S. Beukelmand, David W. Ramsey, and Andrew D. Barron, *Summary Distribution of Slides and Earth Flows in Marin County, California,* U.S. Department of Interior, U.S. Geologic Survey.

3.8.4 Methodology

Geology Resources. The alternatives are evaluated qualitatively in terms of their effect on geologic and paleontological resources. Because paleontological resources are contained within the local geology, they are analyzed together. The following impacts thresholds were defined for each level of impact:

- *Negligible:* Geologic or paleontological resources would not be affected, or the effects would be at low levels of detection and would not have a discernible effect on resources or public use of those resources.
- *Minor:* Effects on geologic or paleontological resources would be detectable but would not be appreciable.
- *Moderate:* Effects on geologic or paleontological resources would be readily apparent and long-term, and would result in substantial, noticeable effects on geologic or paleontological resources on a local scale.
- *Major:* Effects on geologic or paleontological resources would be readily apparent and long-term, and would result in substantial, noticeable effects to geologic or paleontological resources on a regional scale.

Short-term impacts are temporary in nature (and often associated with construction), whereas long-term impacts would have a continuing effect on the natural and human environment. Beneficial impacts would improve the protection, public enjoyment, or understanding of geologic and paleontological resources, whereas adverse impacts would reduce the protection, public enjoyment, or understanding of the resources. Removal of in-place rock is considered a loss of geologic resource and an adverse impact.

Soils, Seismicity, and Landslide Hazards. The alternatives are evaluated qualitatively in terms of their effect on soils, seismicity, and landslide potential. The following impact thresholds were defined for soils, seismicity, and landslides:

- *Negligible:* Risks to the public and the environment from soil erosion and seismic or landslide events would remain unchanged, or the change in risk would be at such a low level of detection it would not and would not have a discernible effect on resources or public safety.
- *Minor:* The change in risks to the public and the environment from soil erosion and seismic or landslide events would be detectable but would not be appreciable.
- *Moderate:* The change in risks to the public and the environment from soil erosion and seismic or landslide events would be readily apparent and long term, with substantial, noticeable changes in risks to the public and the environment at multiple sites within the study area.
- *Major:* The change in risks to the public and the environment from soil erosion and seismic or landslide events would be readily apparent, long term, and would result in substantial, increased risks to the public and the environment throughout the study area.

Short-term impacts are temporary in nature (and often associated with construction), whereas long-term impacts would have a continuing effect on the natural and human environment. Beneficial impacts would reduce soil erosion and reduce risks to the public in seismic and landslide events, whereas adverse impacts would increase soil erosion and increase risks to the public in seismic and landslide events.

3.8.5 Alternative A: No Action Alternative

For Alternative A, all of the existing exposed rock cut faces, geologic and potential paleontological resources would remain unaltered. Implementation of Alternative A would have no effect on geology, soils, or seismicity within the project area.

Cumulative Effects. Alternative A would not result in additional impacts to geologic resources. Therefore, under this alternative there would be no cumulative impacts on geologic resources, soils, or seismic hazards.

Conclusion. Implementation of Alternative A would not result in ground-disturbing construction and the project area would remain unchanged as compared to existing conditions. Therefore, this alternative would have no effect on geology, soils, or seismicity within the project area.

3.8.6 Alternative B: 16-Foot Catchment Alternative

Implementation of the Alternative B would result in extensive ground-disturbing construction activities including, but not limited to, cut and fill operations, grading, and micropile installation.

Geologic and Paleontological Resources. Under Alternative B, the new cut slope would be established to allow for a 16-foot rockfall catchment ditch at the toe of the slope, and 5-foot shoulders along Alexander Avenue. The height of the new cut would be approximately 77 feet. Excavation of the existing rock cut would result in the removal of approximately 26,500 CY of rock material, expected to be comprised mainly of "greenstone" basalt and chert. To reduce the loss of park geologic resources, GGNRA anticipates being able to utilize on the order of 10,000 CY of the roadcut material on projects within 10 miles driving distance from the project area. The remainder of the material is anticipated to require disposal outside of GGNRA boundaries. Compliance will be handled separately for the projects that would receive earth materials from the proposed project. Excavation of the east slope would alter the appearance of this geologic exposure, and would result in the loss of 26,500 cubic yards of GGNRA's geologic resource. The single-cell radiolarian fossils contained in the chert rock are considered very common. They are expected to also be contained in the underlying rock that would be exposed after excavation. Further, geologic resources extracted from the east slope would be reused within GGNRA to the greatest extent possible. Therefore, Alternative B would result in a local, long term, moderate and adverse effect on geologic resources as a result of cut and fill activities along Alexander Avenue.

Soils, Seismicity, and Landslide Hazards. Under Alternative B, Alexander Avenue would be widened above the Bunker Road Arch Tunnel. Because the tunnel is considered inadequate to support the additional load of conventional earthen fill, to widen the roadway widening a micropile foundation

would be installed to support a retaining wall structure above the tunnel. The micropile foundation would allow the widening of Alexander Avenue without increasing the load on the tunnel.[25] The retaining wall would be designed to meet all relevant seismic building codes and standards.

To reduce the potential for adverse effects related to short-term and long-term erosion of the excavated rock cut, retaining wall structure, and reconstructed roadway, erosion and sediment control would be completed with sediment logs, rock check dams, inlet protection, and erosion control matting. Exposed soil would be seeded for permanent erosion control. Per recommendations made in the Preliminary Geotechnical Investigation Report, the east-side rock slope would be excavated to a stable slope configuration and rock scaling would be performed after excavation to remove loose or unstable rocks.[26] Further, under Alternative B, a 16-foot rockfall catchment ditch would be created at the toe of the east slope to collect rocks before they enter the travelled way. However, as described in the Preliminary Geotechnical Investigation Report, the existing east rock cut along Alexander Avenue, south of Danes Drive is characterized by stable slopes and would remain stable after implementation of Alternative B. Therefore stabilization measures and long-term maintenance would be minimal. In the short term, excavating the existing rock cut, constructing the retaining wall structure, and reconstructing the roadway could expose soils to erosion; however, implementing the erosion control measures identified above as well as best management practices identified in the required Stormwater Pollution Prevention Plan (SWPPP) would reduce the severity of this impact to local, negligible, and adverse. Because there is currently no catchment ditch along Alexander Avenue, Alternative B would enhance the safety of roadway users associated with rockfall and landslide hazards; therefore, long-term effects would be local, minor, and beneficial.

Cumulative Effects. The EIS completed for the TIMP included the transportation improvements under consideration as part of the proposed project as a transportation element of the Fort Baker Plan. The EIS cumulative analysis determined that the roadway improvements included in the TIMP would result in adverse cumulative effects related to geologic and paleontological resources. Alternative B would also result in adverse cumulative effects related to geologic and paleontological resources. Therefore, this alternative would have long-term, moderate, and adverse effects on geologic and paleontological resources.

The TIMP EIS found that cumulative effects associated with current and future projects in the Fort Baker and GGNRA Marin Headlands area (including the proposed project) would be beneficial with regard to soil erosion; therefore impacts on soils would be moderate and beneficial because of erosion reducing best management practices. When considered as a whole, Alternative B would result in a long-term, moderate, and adverse cumulative effect on geologic resources.

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[25] Yeh and Associates, Inc., *Preliminary Geotechnical Investigation Report,* Danes Drive Ca PRA/NPS GOGA 268(1), Golden Gate National Recreation Area, California, August 14, 2009.

[26] Yeh and Associates, Inc., *Preliminary Geotechnical Investigation Report,* Danes Drive Ca PRA/NPS GOGA 268(1), Golden Gate National Recreation Area, California, August 14, 2009.

Conclusion. Impacts on local geologic resources would be long term, moderate, and adverse as a result of removal of 26,500 cubic yards of material associated with the proposed road cut. The single-cell radiolarian fossils contained in the chert rock are considered very common. They are expected to also be contained in the underlying rock that would be exposed after excavation. Construction of Alternative B would result in local, short-term, negligible, and adverse effects on soils due to the potential for erosion and landslides. However, in the long-term, implementation of this alternative would include measures to reduce risk from rockfalls, resulting in minor beneficial effects with respect to soils, seismicity and landslide risk.

3.8.7 Alternative C: 5-Foot Catchment Alternative

Alternative C would result in excavation of the east slope of the existing rock cut to allow for the widening of Alexander Avenue and the establishment of a 5–foot rockfall catchment ditch. Excavating the existing rock cut would result in the removal of approximately 18,000 CY of rock material, expected to be comprised mainly of "greenstone" basalt and chert. To compensate for the smaller rockfall catchment ditch, this alternative would require installation of rockfall mesh across the entire face of the new rock cut. However, Alternative C would reduce the size of the new cut and total excavated material compared to Alternative B, and would result in a higher level of safety related to rockfall and landslide hazards.

With the exception of the rockfall catchment and rockfall mesh, Alternative C would include all project components described under Alternative B. Additionally, construction activities required to implement Alternative C, including the rock cut would be similar to those necessary for implementation of Alternative B, except the amount of excavated material would be substantially less for Alternative C than for Alternative B. Similar to Alternative B, in order to reduce the loss of park geologic resources, GGNRA anticipates being able to utilize on the order of 10,000 CY of the roadcut material on projects within 10 miles driving distance of the project site. The remainder of the material is anticipated to require disposal outside of GGNRA boundaries. Compliance will be handled separately for the projects that will receive earth materials from the proposed project. Therefore, this alternative would have a local, long-term, moderate, and adverse effect on geologic resources within the project area. All short-term and long-term erosion control measures for Alternative B would be included in Alternative C as well. During construction activities effects on soils, seismicity, and landslide hazards would be local, minor, and adverse. Long term effects on soils, seismicity, and landslide hazards would be local, minor, and beneficial.

Cumulative Effects. Alternative C would result in excavation of approximately 18,000 CY of geologic material, place fill material above the Bunker Road Arch Tunnel, and would reconstruct the existing roadway. Impacts related to seismic safety, erosion, and landslide potential would be site specific and would have no effect on cumulative conditions. However, as stated previously this alternative would remove approximately 8,000 CY of material from GGNRA, thereby contributing to the cumulative removal of geologic material from GGNRA. Therefore, this alternative would result in a long-term, minor, and adverse cumulative effect on geologic resources.

Conclusion. Impacts on local geologic resources would be long term, moderate, and adverse as a result of the removal of 18,000 CY of total material associated with the proposed road cut along Alexander Avenue. The single-cell radiolarian fossils contained in the chert rock are considered very common. They are expected to also be contained in the underlying rock that would be exposed after excavation. Construction of this alternative would result in local, short-term, negligible, and adverse effects on soils due to the potential for erosion and landslides. In the long term, implementation of this alternative would include measures to reduce risks associated with erosion, rockfall, and landslides resulting in local, negligible beneficial effects to these risks.

3.8.8 Alternative D: 8-Foot Catchment Alternative

Alternative D would result in excavation of the east slope of the existing rock cut to allow for the widening of Alexander Avenue and the establishment of an 8–foot rockfall catchment ditch. Approximately 400 linear feet of the existing rock cut face would be excavated. Excavating the existing rock cut would result in the removal of approximately 21,600 CY of rock material, expected to be comprised mainly of "greenstone" basalt and chert. By reducing the amount of excavated material compared to Alternative B and providing a similar level of rockfall and landslide protection as in Alternative C (through the installation of a temporary barrier), Alternative D represents a comprise between the previous two action alternatives.

With the exception of the rockfall catchment ditch and temporary barrier, Alternative D would include all project components described for the previous two action alternatives. With the exception of excavated material, construction activities required to implement Alternative D, including the rock cut would be similar to those necessary for implementation of the previous two action alternatives. In order to reduce the loss of park geologic resources, GGNRA anticipates being able to utilize on the order of 10,000 CY of the roadcut material on projects within 10 miles driving distance of the project site. The remainder of the material is anticipated to require disposal outside of GGNRA boundaries. Compliance will be handled separately for the projects that will receive earth materials from the proposed project. Therefore, this alternative would have a local, long-term, moderate, and adverse effect on geologic resources within the project area. All short-term and long-term erosion control measures identified for the previous two action alternatives would be included in Alternative D. During construction activities effects on soils, seismicity, and landslide hazards would be local, minor, and adverse. Long term effects on soils, seismicity, and landslide hazards would be local, minor, and beneficial.

Cumulative Effects. Alternative D would result in excavation of approximately 21,600 CY of geologic material, place fill material above the Bunker Road Arch Tunnel, and would reconstruct the existing roadway. Impacts related to seismic safety, erosion, and landslide potential would be site specific and would have no effect on cumulative conditions. However, as stated previously this alternative would remove approximately 11,600 CY of material from GGNRA, thereby contributing to the cumulative removal of geologic material from GGNRA. Therefore, this alternative would result in a long-term, minor, and adverse cumulative effect on geologic resources.

Conclusion. Impacts on local geologic resources would be long term, moderate, and adverse as a result of the removal of 21,600 CY of total material associated with the proposed road cut along Alexander Avenue. The single-cell radiolarian fossils contained in the chert rock are considered very common. They are expected to also be contained in the underlying rock that would be exposed after excavation. Construction of this alternative would result in local, short-term, negligible, and adverse effects on soils due to the potential for erosion and landslides. In the long term, implementation of this alternative would include measures to reduce risks associated with erosion, rockfall, and landslides resulting in local, negligible beneficial effects to these risks.

3.9 Noise

3.9.1 Introduction

This section summarizes the existing ambient noise conditions in the project area and describes the short-term effect that implementation of the proposed project would have on ambient noise levels. In addition, this section describes the applicable laws, regulations, and policies associated with noise management. The proposed project would not result in a change in traffic volumes or traffic speeds at the Alexander Avenue/Danes Drive intersection, and would not move traffic sources substantially closer to any sensitive receptors. Therefore, the proposed project would have no adverse effects on long-term operational noise levels within the project area and long-term effects are not evaluated further.

3.9.2 Regulatory Framework

The natural soundscape, sometimes called natural quiet, is the aggregate of all the natural sounds that occur in parks, absent human-caused sound, together with the physical capacity for transmitting the natural sounds.[27] These intrinsic sounds are recognized and valued as a park resource in keeping with the NPS mission. NPS Management Policies 2006 and Director's Order #47, Sound Preservation and Noise Management mandate that parks preserve the natural soundscape associated with national park units.[28] The objective is to maintain the natural soundscape conditions that are currently not impacted by inappropriate noise sources and to facilitate and promote progress toward restoration of the natural soundscape where it is degraded.

FHWA has adopted procedures for the abatement of highway traffic noise (23 CFR 772). These procedures, which are followed by transportation agencies performing noise studies for actions involving federal-aid funding, contain noise abatement criteria with respect to specific land uses. For parks and residences, traffic noise impacts are identified when the predicted noise level approaches or exceeds 67 decibels (dBA).

The *State of California General Plan Guidelines* provides guidance for exterior noise levels. Generally, residential uses are considered to be acceptable in areas where exterior noise levels do not exceed 60

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[27] National Park Service, U.S. Department of Interior, *Management Policies 2006*, Section 4.9: Soundscape Management, website: http://www.nps.gov/policy/MP2006.pdf, accessed June 7, 2011.

[28] National Park Service, U.S. Department of Interior, *Director's Order #47: Soundscape Preservation and Noise Management,* December 1, 2000, website: http://www.nps.gov/policy/DOrders/DOrder47.html, accessed June 8, 2011.

dBA; residential uses are normally unacceptable in areas exceeding 70 dBA.[29] Schools are normally acceptable in areas up to 70 dBA and normally unacceptable in areas exceeding 70 dBA. Commercial uses are normally acceptable in areas up to 70 dBA and are conditionally acceptable between 67.5 and 77.5 dBA, depending on the noise insulation features and the noise reduction requirements. The guidelines also present adjustment factors that may be used to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

The *Marin Countywide Plan* outlines a number of policies intended to ensure that new land uses, transportation activities, and construction do not create noise levels that adversely affect noise-sensitive land uses. Noise-related policies applicable to the proposed project include, but not limited to:

- *Goal NO-1. Protection from Excessive Noise.* Ensure that new land uses, transportation activities, and construction do not create noise levels that impair human health or quality of life.
- *Policy NO-1.2. Minimize Transportation Noise.* Ensure that transportation activities do not generate noise beyond acceptable levels, including in open space, wilderness, wildlife habitat, and wetland areas.
- *Policy NO-1.3. Regulate Noise Generating Activities***.** Require measures to minimize noise exposure to neighboring properties, open space, and wildlife habitat from construction-related activities, yard maintenance equipment, and other noise sources, such as amplified music.
- *Policy NO-1.i. Regulate Noise Sources.* Sections 6.70.030(5) and 6.70.040 of the Marin County Code establish allowable hours of operation for construction-related activities. As a condition of permit approval for projects generating significant construction noise impacts during the construction phase, construction management for any project shall develop a construction noise reduction plan and designate a disturbance coordinator at the construction site to implement the provisions of the plan.

The Marin County Board of Supervisors recently adopted a code related to construction activities and related noise that states that hours for construction activities are to be limited to the hours between 7 a.m. and 6 p.m. Monday through Friday and between 9 a.m. and 5 p.m. on Saturday. Construction activities are prohibited on Sundays and holidays. During construction, NPS would strive to conform with the recently adopted code to the greatest extent feasible. NPS would determine the hours of construction based on this local jurisdiction requirement, the type of construction, site location, and noise-sensitivity of nearby land uses. The conditions of approval (or in the case of federal actions, environmental commitments or mitigation measures) shall specify hours for staging and type of construction activities.

[29] State of California, Governor's Office of Planning and Research, General Plan Guidelines 2003, website: http://www.opr.ca.gov/planning/publications/General_Plan_Guidelines_2003.pdf, accessed June 13, 2011.

3.9.3 Affected Environment

The noise environment of the project site is influenced predominantly by vehicular traffic along Alexander Avenue, Danes Drive, East Bunker Road, and US 101. The project area is in a transportation corridor and is surrounded primarily by open space. However, the Fort Baker complex is located directly east of the project site. Cavallo Point Lodge is a destination park lodge with 142 guest lodging units as well as meeting, restaurant, lounge, spa, and event spaces located within the Fort Baker complex. All facilities are open to the public. In 2008 the Golden Gate National Parks Conservancy in partnership with NPS opened the Institute at Golden Gate. The Institute serves as a conference center for collaborative, multi-disciplinary, meetings focused on sustainability and environmental problem-solving. Additionally, as part of a historic district, Fort Baker is a major tourist attraction.

The closest overnight lodging unit at Fort Baker is Building 531 along Kober Street at the Cavallo Point Lodge. Building 531 is approximately 715 feet from the Alexander Avenue/Danes Drive intersection. Geographically, Fort Baker is protected from noise associated with US 101, Alexander Avenue, and East Bunker Road by steep hillsides that border the majority of the Fort Baker site. Because there are limited uses within and surrounding Fort Baker, the primary noise source is traffic. The existing ambient noise level at Fort Baker is 54 dBA L_{dn}, with daytime noise levels ranging from 48 to 53 dBA L_{eq} and nighttime noise levels ranging from 40 to 51 dBA L_{eq}.[30,31,32]

3.9.4 Methodology

To assess potential short-term construction noise impacts, sensitive receptors and their relative exposure (considering topographic barriers and distance) were identified. For the purpose of this analysis, sensitive receptors are defined as overnight guests at Fort Baker. To establish a baseline noise level at Fort Baker, ambient noise levels were monitored for a period of 24 hours.

Combined intermittent noise levels from the simultaneous operation of onsite equipment expected to be used in project construction were determined based on typical construction equipment noise levels, as indicated in Table 3-4. Based on these noise levels and a typical noise attenuation rate of 6 dBA per doubling of distance, resultant noise levels at noise-sensitive receptors were calculated. Once calculated, the construction-related noise levels were compared with the existing ambient noise level at Fort Baker.

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[30] **L_{eq}**, the equivalent-energy noise level, is the average acoustic energy content of noise over any chosen exposure time. The L_{eq} is the constant noise level that would deliver the same acoustic energy to the ear as the actual time-varying noise over the same exposure time. L_{eq} does not depend on the time of day during which the noise occurs.
L_{dn}, the day-night average noise level, is a 24-hour average L_{eq} with a 10 dBA "penalty" added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for increased nighttime noise sensitivity. Because of this penalty, the L_{dn} would always be higher than its corresponding 24-hour L_{eq} (e.g., a constant 60 dBA noise over 24 hours would have a 60 dB L_{eq}, but a 66.4 dBA L_{dn}).

[31] Average noise exposure over a 24-hour period is often presented as a day-night average sound level (Ldn). Ldn values are calculated from hourly Leq values, with the Leq values for the nighttime period (10 p.m.-7 a.m.) increased by 10 dB to reflect the greater disturbance potential from nighttime noise.

[32] Based on a 24-hour ambient noise measurement taken near the hotel lodge at Fort Baker closest to the project area from June 29 to June 30, 2011.

Long-term noise impacts would be associated with changes in traffic noise levels based on average daily traffic volumes. As described above, the proposed project would not change the volume of traffic or traffic speeds at the Alexander Avenue/Danes Drive intersection, and would not move traffic sources substantially closer to any sensitive receptors. Therefore, long-term noise impacts are not considered further.

Table 3-4
Summary of Typical Construction Equipment Noise Levels

Equipment	Typical Maximum Noise Level 50 feet from the Source (dBA)	Usage (%)[a]
Air compressor	80	40
Backhoe	80	40
Blasting	94	1
Dozer	85	40
Compactor	80	20
Concrete mixer truck	85	40
Dump truck	84	40
Excavator	85	40
Generator	82	50
Grader	85	40
Jack hammer	85	20
Mounted Impact Hammer (hoe ram)	90	20
Paver	85	50
Pickup truck	55	40
Rock Drill	85	20
Roller	85	20
Scraper	85	40

Source: FHWA Roadway Construction Noise Model.

Note:

a. Indicates the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power. In the case of construction blasting, the equipment gives a very short duration blast, and as such has 1% usage factor in the Roadway Construction Noise Model.

For this analysis the intensity of noise impacts is based on the degree of predicted change in sound levels from the Alternatives. The following thresholds are associated with each level of impact:

- *Negligible:* The change in sound levels would not be perceptible (i.e., less than 3 dBA).
- *Minor:* Sound levels would change by 3 to 5 dBA. The short-term changes would result in noise levels that would shift between the "normally acceptable" and "conditionally acceptable" ranges of the "California Land Use Noise Compatibility Guidelines."[33]

[33] State of California, Governor's Office of Planning and Research, General Plan Guidelines 2003, website: http://www.opr.ca.gov/planning/publications/General_Plan_Guidelines_2003.pdf, accessed June 13, 2011.

- *Moderate:* Sound levels would change by 6 to 9 dBA. The short-term changes would result in noise levels that would shift between the "conditionally acceptable" and "normally unacceptable" ranges of the "California Land Use Noise Compatibility Guidelines."
- *Major:* Sound levels would change by more than 9 dBA. The short-term or long-term changes would result in noise levels that would shift between the "clearly unacceptable" and "normally unacceptable" ranges of the "California Land Use Noise Compatibility Guidelines."

3.9.5 Alternative A: No Action Alternative

There would be no construction activities required for implementation of Alternative A. As a result, this alternative would have no effect on noise levels in the project area.

Cumulative Effects. Alternative A would generate construction noise that could contribute to cumulative, short-term noise increases from construction activities associated with the TIMP or the Fort Baker Plan.

Conclusion. Alternative A would have no effect on noise levels in the project area or surrounding region.

3.9.6 Alternative B: 16-Foot Catchment Alternative

Table 3-3 above lists the typical noise levels for some of the equipment that could be used during construction of the Alternative B. Some areas of natural soundscapes would be affected in the short term by construction noise during the daytime and nighttime hours. The simultaneous operation of onsite construction equipment could result in maximum noise levels of up to 94 dBA at 50 feet from the proposed construction. Based on this noise level and a typical noise attenuation rate of 6 dBA per doubling of distance, exterior noise levels at noise-sensitive receptors 600 feet from construction activities (such as, the hotel lodges at Fort Baker) could be up to 72 dBA during blasting activities. However, these would be peak noise levels that would be intermittent during the construction period.

Table 3-5 below provides an example of the typical average noise level that could occur during the construction phases. A combination of four pieces of equipment that could be operating during each phase of construction was selected. For excavation, this includes the use of blasting, rock drill, dump truck, and a dozer. For paving, this includes a dozer, concrete mixer truck, roller, and paver. As shown in Table 3-4, noise levels at the closest noise sensitive receptors (600 feet from construction activity) would be approximately 60 dBA during each phase, with noise levels at lodges farther from the construction site having noise levels of approximately 55 dBA. However, noise levels at the hotel would likely be less than those predicted in the table because of intervening topography. Noise reductions from the intervening topography could be as much as 15 dBA.[34]

[34] Federal Transit Administration Transit Noise and Vibration Impact Assessment, May 2006, page 6-25.

Table 3-5
Typical Outdoor Construction Noise Levels

Construction Phase	Noise Level at 50 Feet (dBA Leq)	Noise Level at 600 Feet (dBA Leq)	Noise Level at 1,000 Feet (dBA Leq)
Excavation[a]	81	60	55
Roadway Construction/Paving[b]	81	60	55

Source: FHWA Roadway Construction Noise Model.

Notes:

Noise levels do not account for intervening terrain, which could further reduce noise levels by up to 15 dBA.

a. Assumes operation of blasting, rock drill, dump truck, and dozer.

b. Assumes operation of dozer, concrete mixer truck, roller, and paver.

As noted above, the existing ambient noise level at Fort Baker is 54 dBA L_{dn}, with daytime noise levels ranging from 48 to 53 dBA L_{eq} and nighttime noise levels ranging from 40 to 51 dBA L_{eq}. The majority of construction is expected to occur during daytime hours; however, excavation operations could be performed at night to limit traffic impacts along roadways. With average construction noise levels of 60 dBA (not including reductions from topography), the increase over existing daytime levels would be approximately 7 to 12 dBA, and the increase over existing nighttime noise levels would be approximately 9 to 20 dBA. However, these overall noise levels would be below the "normally unacceptable" ranges of the California Land Use Noise Compatibility Guidelines for hotel uses, which identifies exterior noise levels for hotel uses to be normally acceptable up to 65 dBA. The interior noise standard for hotel uses is 45 dBA.[35] When evaluating exterior to interior noise reduction due to a building façade and resulting interior noise levels, the standard exterior to interior reduction is 25 dBA with windows closed and 15 dBA with windows open. Therefore, with average construction noise levels of 60 dBA at 600 feet from the project area, even with lodge windows open, the interior noise level would meet the 45 dBA standard. As such, even though Alternative B could increase noise levels at the identified hotel lodging areas, the overall noise levels would be within acceptable levels for hotel uses. It should be noted that this is a conservative estimate as the nearest overnight uses are further than 600 feet from the project area and estimated noise levels would be further reduced due to the intervening terrain.

Individuals near construction areas could experience temporary increases in ambient noise levels. Overall, short-term, construction-related noise impacts would be moderate and adverse.

Cumulative Effects. Alternative B would only contribute to short-term noise construction impacts. Construction activities associated with Alternative B would have short-term, moderate, and adverse impacts on noise in the region. This would result in moderate and adverse cumulative impacts in conjunction with past, present, and future projects.

[35] Governor's Office of Planning and Research, General Plan Guidelines: Appendix C: Noise Element Guidelines, 2003, website: http://opr.ca.gov/docs/General_Plan_Guidelines_2003.pdf, accessed December 16, 2011.

Conclusion. Construction-generated noise would be considered to have an adverse, short-term impact to guests at the hotel lodges when construction activities are taking place in these areas. Integration of the mitigation measures described below into the project design would reduce noise impacts to the extent feasible; however, short term impacts would remain moderate and adverse.

3.9.7 Alternative C: 5-Foot Catchment Alternative

Alternative C would result in the use of the same construction equipment as Alternative B. Because Alternative C would result in construction of a 5-foot rockfall catchment ditch as opposed to a 16-foot ditch (as required under Alternative B), the extent and duration of excavation would be less. The construction activities required to implement Alternative C would be essentially the same as those necessary for Alternative B. Under Alternative C, peak construction-related noise levels would be the same as those identified for Alternative B. Additionally, implementation of Alternative C would adhere to the noise-reducing mitigation measures described below. As such, implementation of Alternative C would result in local, short-term, moderate, adverse noise effects.

Cumulative Effects. Alternative C would only contribute to short-term noise construction impacts. Construction activities associated with Alternative C would have short-term, moderate, and adverse impacts on noise in the region. This would result in minor to moderate and adverse cumulative impacts in conjunction with past, present, and future projects.

Conclusion. Alternative C would result in moderate short-term, construction-related, adverse noise effects.

3.9.8 Alternative D: 8-Foot Catchment Alternative

Alternative D would result in the use of the same construction equipment as described for the previous two action alternatives. As described in Section 3.8, above, Alternative D would require excavation of approximately 21,600 CY of material from the east slope along Alexander Avenue. As such, the extent and duration of excavation required for Alternative D would less than required for Alternative B and greater than Alternative C. Otherwise, the construction activities required to implement Alternative D would be essentially the same as those necessary for the previous two action alternatives. Under Alternative D, peak construction-related noise levels would be similar to those identified for Alternative B. Additionally, implementation of Alternative D would adhere to the noise-reducing mitigation measures described below. As such, implementation of Alternative D would result in local, short-term, moderate, adverse noise effects.

Cumulative Effects. The cumulative noise effect of Alternative D would be the same as Alternative B.

Conclusion. Alternative D would result in moderate short-term, construction-related, adverse noise effects.

3.9.9 Mitigation Measures

The following mitigation measures shall be implemented to reduce noise associated with construction activities and equipment to the extent feasible.

NOI-1 Noise Restrictions. Mitigation measures providing hourly restrictions for noise-generating construction activities shall be developed by NPS staff in consultation with Marin County representatives and Cavallo Point Lodge personnel.

NOI-2 Employ Noise Reducing Construction Practices. To reduce noise and potential disturbance due to construction, contractors shall muffle or control noise from construction equipment by using the following measures:

- Equipment and trucks used for construction shall utilize noise control techniques (such as, improved mufflers, use of intake silencers, ducts, engine enclosures and acoustically attenuating shields or shrouds, and installation of sound blankets around the project site, wherever feasible). All vehicles shall meet federal standards for the year they were built. Construction vehicles shall be properly maintained and equipped with exhaust mufflers that meet state standards. To reduce noise and emissions, construction equipment shall not be permitted to idle for long periods of time.
- Impact tools (such as, jackhammers and pavement breakers) used for construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be use. External jackets on the tools themselves shall be used where feasible. Quieter procedures shall be used, such as drilling rather than impact or blasting equipment whenever feasible.

3.10 Public Health and Safety

3.10.1 Introduction

This section evaluates the potential for the Alexander Avenue/Danes Drive Intersection Improvement Project (proposed project) to expose workers or the public to hazardous materials. This section describes applicable policies, plans, and regulations associated with the use, transport, and handling of hazardous materials. Additionally, this section identifies mitigation measures intended to reduce the potential for accidental release of hazardous materials during implementation of the proposed project. Issues related to vehicular, bicycle, and pedestrian safety is addressed in Section 3.3, Transportation. Refer to Section 3.8, Geologic Resources, Soils, and Seismic Hazards, for analysis pertaining to risks associated with rockfall hazards at the project site.

3.10.2 Regulatory Framework

The U.S. Army Corps of Engineers (Corps) is required to clean up contaminated areas to a level protective of human health and the environment. The Corps is conducting investigation and remediation actions in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the Resource Conservation and Recovery Act, the Base Realignment and Closure Act (BRAC), the California Health and Safety Code, the California Water Code, and other relevant authorities. The California Department of Toxic Substances Control (DTSC) is the lead agency for oversight of Army cleanup activities, and the San Francisco Regional Water Quality Control Board (RWQCB) works in conjunction with DTSC on issues of water quality and hydrocarbon releases.

As part of the remediation process, the Corps has conducted a limited site investigation of Fort Barry and will proceed with a remedial investigation and feasibility study for several chemically impacted areas at Fort Barry. The investigation and study will be followed by the development of a remedial action plan and a ROD for the preferred remedial alternative. Interim remedial actions may be taken at several impacted areas to accelerate remediation efforts.

NPS is reviewing investigations and remedial measures being conducted by the Corps at Fort Baker under both the Formerly Used Defense Site (FUDS) and BRAC programs. Issues include fuel distribution lines, lead-based paint, asbestos, waste oil tanks, and other issues related to work being conducted within the FUDS program. The FUDS area consists of 264 acres surrounding the central area of Fort Baker (the area that was transferred to NPS under the BRAC Act in 1985). The Corps is independently addressing environmental issues within the FUDS area. These issues primarily consist of petroleum releases associated with former aboveground and underground tanks.

A "Draft Records Research Report for Fort Baker" has been completed by the Corps.[36] Field investigations were conducted at six petroleum sites, and NPS has requested action at several other sites. A work plan for field investigations at three CERCLA sites was scheduled during 2006, and NPS has requested actions at several other sites. A preliminary assessment and a site inspection for multiple sites at Fort Barry have been completed. NPS has requested further action at several sites; however, the NPS is unaware of any further work planned by the Corps.

3.10.3 Affected Environment

The project area is located along an elevated slope west of Fort Baker. The Corps has conducted extensive investigations at Fort Baker to determine, locate, and identify the extent and scope of hazardous substances released over the 100 years of military use. During the site investigation of Fort Baker, eight areas were identified with elevated soil concentrations of polycyclic aromatic hydrocarbons, pesticides, metals, and petroleum hydrocarbons. Of the eight areas, four have been recommended for advancement to a remedial and feasibility investigation. These areas include the storm drain system, Horseshoe Bay, a petroleum tank site near building 637, and a concrete basin near building 407. The four remaining areas (an engine repair shop, a small paint shed, soil beneath the

[36] U.S. Army Corps of Engineers, Sacramento District, *Draft Final Records Report for Fort Baker, Sausalito, California,* prepared I cooperation with TechLaw, 2004.

deck of the historic boat shop, and the vehicle wash rack adjacent to building 691) have been remediated. In addition, the Corps has identified and is addressing a number of petroleum release sites.

3.10.4 Methodology

The alternatives are evaluated qualitatively in terms of their effect on the following public health and safety issues: exposure to contaminated sites/hazardous substances; personal safety (for visitors and non-visitors); emergency vehicle access. Traffic-related safety concerns, including bicycles, are addressed under the transportation sections of this document.

Short-term impacts would be temporary in nature (and often associated with construction), whereas long-term impacts would have a continuing effect on human health and safety.

Beneficial impacts would improve human health and safety, whereas adverse impacts would reduce human health and safety. The following intensity levels were defined:

- *Negligible:* Public health and safety would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on public health or safety.
- *Minor:* Effects on public health and safety would be detectable but would not be appreciable.
- *Moderate:* Effects would be readily apparent and long-term, and they would result in substantial, noticeable effects to public health and safety on a local scale.
- *Major:* Effects would be readily apparent and long-term, and they would result in substantial, noticeable effects to public health and safety on a regional scale.

3.10.5 Alternative A: No Action Alternative

For Alternative A, the project area would remain unchanged from existing conditions and would not involve construction or ground-breaking activities. Thus, implementation of Alternative A would not result in the potential accidental release of hazardous materials or exposure of hazardous substances by construction workers or the public. However, under this alternative the existing transportation-related safety concerns addressed in Section 3.3, Transportation, would continue. Therefore, Alternative A would have no effect on public health and safety in addition to the vehicular safety issues addressed in Section 3.3, Transportation.

Cumulative Effects. Although the Fort Baker Plan EIS and the TIMP EIS identified the presence of hazardous materials within the GGNRA, Alternative A would not contribute to the potential for the release of hazardous materials through construction activities or project operation. Alternative A would have no effect on cumulative public health and safety conditions related to hazardous materials.

Conclusion. Alternative A would have no effect on public health and safety in addition to transportation-related safety issues addressed in Section 3.3, Transportation.

3.10.6 Alternative B: 16-Foot Catchment Alternative

Alternative B would result in extensive ground-disturbing construction activities including but not limited to, cut and fill operations, grading, and micropile installation. Construction activities would require the use of potentially hazardous materials, such as fuels, oils, or other fluids associated with the operation and maintenance of vehicles and equipment. These materials are generally contained in vessels engineered for safe storage. Large quantities of these materials would not be stored at or transported to the construction site.

Spills, upsets, or other construction-related accidents could result in a release of fuel or other hazardous substances into the environment. To reduce the potential for adverse effects related to the accidental release or exposure of hazardous materials, Alternative B would adhere to the mitigation measures identified below, and in the TIMP EIS ROD. Therefore, local, adverse short-term effects would be negligible. As a transportation enhancement project, implementation of Alternative B would not result in the long-term use, storage, or transport of hazardous materials. Operation of Alternative B would not expose the public to hazardous materials. Therefore, in the long-term, impacts to public health and safety would be local, negligible and adverse.

Cumulative Effects. As described in the TIMP EIS, known and suspected contamination at Fort Baker as well as other locations within the GGNRA has or is currently undergoing remediation. The TIMP EIS included the transportation improvements under consideration as part of the proposed project as a transportation element of the Fort Baker Plan. The cumulative analysis provided in the EIS determined that the roadway improvements included in the TIMP would not result in adverse cumulative effects related to public health and safety. Therefore, Alternative B would also not result in adverse cumulative effects related to public health and safety. The TIMP EIS found that cumulative effects associated with current and future projects in the Fort Baker and GGNRA Marin Headlands area would be beneficial to public health and safety by reducing the risks from exposure to hazardous materials.

Conclusion. Alternative B would result in negligible adverse short-term and long-term local effects on public health and safety related to exposure of hazardous materials during construction and operation of this alternative.

3.10.7 Alternative C: 5-Foot Catchment Alternative

Implementation of Alternative C would result in the same ground-disturbing construction activities and equipment as described under Alternative B. Furthermore, Alternative C would adhere to the mitigation measures identified below. Therefore, Alternative C would result in the same local, short-term, negligible, and adverse effects on public health and safety as determined for Alternative B.

Cumulative Effects. The cumulative effects of Alternative C would be the same as Alternative B.

Conclusion. Alternative C would result in local, negligible, short-term and long-term adverse effects on public health and safety.

3.10.8 Alternative D: 8-Foot Catchment Alternative

Implementation of Alternative D would result in the same ground-disturbing construction activities and equipment as described for the previous two action alternatives. Furthermore, Alternative D would adhere to the mitigation measures identified below. Therefore, Alternative D would result in the same local, short-term, negligible, and adverse effects on public health and safety as determined for the previous two alternatives.

Cumulative Effects. The cumulative effects of Alternative D would be the same as the previous two action alternatives.

Conclusion. Alternative D would result in local, negligible, short-term and long-term adverse effects on public health and safety.

3.10.9 Mitigation Measures

The following mitigation measures shall be implemented to reduce the potential for adverse impacts associated with hazardous materials:

HAZ-1 Underground Storage Tank Management. If construction was likely to occur before hazardous substance cleanup by the U.S. Army Corps of Engineers in areas where there are known or suspected underground storage tanks, soil contamination, or hazardous materials, then NPS shall take steps to address the portions of these sites that shall be disturbed before construction began. Such steps shall include further exploration to confirm the existence of underground storage tanks, soil contamination, or hazardous materials. If such substances were confirmed, cleanup options shall be determined before construction.

HAZ-2 Prepare Materials Management Plan. A materials management plan that addresses handling of potentially contaminated soils or materials shall be prepared by the contractor prior to excavation operations. Project construction documents shall include plan recommendations.

HAZ-3 Contamination Surveys. In areas where deeper excavation work was proposed, and where there were indications that the military's past use of an area may have resulted in some potential for contamination, additional survey work shall be undertaken during the design phase. Surveys using electromagnetic subsurface diagnostic tools, ground-penetrating radar, seismic refraction, or resistivity tools shall be conducted in the areas to be excavated to determine potential for buried objects (such as storage tanks, vaults, pipelines, and buried drums). If any such objects were found, then steps shall be taken to appropriately confirm and, if necessary, remove the objects and any contamination.

HAZ-4 Spill Prevention and Control Plan. A spill prevention and control plan shall be prepared and shall include the following elements:

- Proper storage, use, and disposal of chemicals, fuels, and other toxic materials shall be required.
- Construction equipment shall be required to be refueled only in upland areas and in conformance with the avoidance zones to prevent fuel spills near sensitive habitats. Equipment shall be inspected for hydraulic and oil leaks regularly, as well as prior to use in the park.
- All heavy equipment in the park shall be required to carry emergency spill-containment materials. For example, pans would be placed under equipment that was stored on site to reduce the potential for leaks of oil and other substances onto park lands. Absorbent materials shall be on hand at all times to absorb any minor leaks and spills.
- An emergency response plan shall be prepared by the contractor(s), approved by NPS, and implemented during project implementation.
- The asphalt batch plant shall not be permitted in the park.

3.11 Special Status Species

3.11.1 Introduction

This section describes special status species in the project area. The alternatives proposed for the proposed project are evaluated in terms of their affect on special status species. Where applicable, mitigation measures are recommended to minimize the potential for adverse effects on special status species. In addition, this section summarizes the applicable laws, regulations, and policies associated with protection of special status species and biological resources in general.

3.11.2 Regulatory Framework

3.11.2.1 Federal Laws and Regulations

Endangered Species Act. The U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) Fisheries division have jurisdiction over species formally listed as threatened or endangered under the Endangered Species Act (16 USC §1531–1544). Section 9 of the act prohibits the "take" of federally listed species, which is broadly defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." USFWS has interpreted the definition of harm to include significant habitat modification. An activity is defined as a take even if it is unintentional or accidental. An endangered species is one that is considered in danger of becoming extinct throughout all, or a significant portion, of its range. A threatened species is one that is likely to become endangered within the foreseeable future. In addition to endangered and threatened species, which are legally protected under the Endangered Species Act, there are lists of candidate species, for which the USFWS currently has enough information to support

a proposal to list it as a threatened or endangered species. Section 7 of the Endangered Species Act outlines procedures for federal interagency cooperation to conserve federally listed species and designated critical habitat. Federal agencies are required to consult with the USFWS to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species. Section 10(a) of the Endangered Species Act allows the USFWS to permit the incidental take of listed species if such take is accompanied by a habitat conservation plan that includes components to minimize and mitigate impacts associated with the take.

U.S. Fish and Wildlife Service. USFWS maintains a list of species of concern, which includes uncommon species for which the agency does not have sufficient information on threats to their existence that would support listing them as either threatened or endangered.

NPS Natural Resource Policies and Guidelines. NPS has developed specific guidelines for the management of natural resources.[37] The guidelines provide for the management of native and non-native plant and animal species. They are designed to assist parks in developing resource management plans and action plans for specific park programs in all park management zones and special use zones as described in the NPS Management Policies 2006 and articulated in each park general management plan. The NPS Management Policies 2006 direct park managers to preserve natural resources, processes, systems, and values of park units in an unimpaired condition to perpetuate their inherent integrity and to provide present and future generations with the opportunity to enjoy them. Natural resources will be managed to preserve fundamental physical and biological processes, as well as individual species, features, and plant and animal communities. NPS will strive to understand, maintain, restore, and protect the inherent integrity of the natural resources, processes, systems, and values of the parks. These are described generally in the 1916 NPS Organic Act and in the enabling legislation or presidential proclamation establishing each park.

Migratory Bird Treaty Act. The Migratory Bird Treaty Act (MBTA), which was first enacted in 1918, implements domestically a series of treaties between the United States and Great Britain (on behalf of Canada), Mexico, Japan, and the former USSR, which provide for international migratory bird protection and authorize the Secretary of the Interior to regulate the taking of migratory birds. The act makes it unlawful, except as permitted by regulations, "at any time, by any means, or in any manner, to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird, included in the terms of conventions" with certain other countries (16 USC 703). This includes direct and indirect acts, although harassment and habitat modification are not included unless they result in the direct loss of birds, nests, or eggs.

3.11.2.2 State Laws and Regulations

Although federal agencies are not required to comply with California's Fish and Game Code, NPS makes every reasonable effort to conduct its actions consistent with relevant State laws and regulations.

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[37] National Park Service, U.S. Department of Interior, *Management Policies 2006*, Section 4: Natural Resource Management, website: http://www.nps.gov/policy/MP2006.pdf, accessed June 13, 2011.

California Endangered Species Act. Pursuant to the California Endangered Species Act, which is administered by the California Department of Fish and Game, state listed threatened or endangered species are protected from any take (California Code of Regulations [CCR], title 14, sec. 670.2 and 670.5; California Endangered Species Act, sec. 2080). The take of State-listed species incidental to otherwise lawful activities requires an incidental take permit. The California Endangered Species Act is similar to the Endangered Species Act both in process and substance: it is intended to provide additional protection to threatened and endangered species in California. The California Endangered Species Act does not supersede the Endangered Species Act, but operates in conjunction with it. Species may be listed as threatened or endangered under both acts (in which case the provisions of both State and federal laws apply) or under only one act.[38]

California Native Plant Protection Act. In addition to the California Endangered Species Act, the California Native Plant Protection Act provides protection to endangered and "rare" plant species, subspecies, and varieties of wild native plants in California. The definitions of "endangered" and "rare" are closely parallel the definitions of "endangered" and "threatened" plant species in the California Endangered Species Act. The California Native Plant Protection lists are used by both the CDFG and USFWS when considering formal species protection under the Endangered Species Act and the California Endangered Species Act.

3.11.3 Affected Environment

The mission blue butterfly (*Plebejus* [*Icaricia*] *icarioides missionensis*) is federally listed as endangered butterfly that historically occurred in open coastal scrub and coastal grassland and prairie habitats where its larval host plants were present. The larval host plants include silver lupine (*Lupinus albifrons*), summer lupine (*Lupinus formosus*), and many colored lupine (*Lupinus versicolor*). While the larvae are restricted to these host plants, adults will also feed on nectar from hairy false golden aster (*Heterotheca villosa*), blue dicks (*Dichelostemma capitatum*), and seaside buckwheat (*Eriogonum latifolium*), but typically do not wander from populations of the lupines that act as larval food plants.

Mission blue butterfly larvae emerge from dormancy in early spring as their host plants produce new growth in the spring. Upon reaching a certain stage of maturity, the larvae migrate underground near the host plants to pupate. Weeks later when the lupines begin to bloom, the adult butterflies emerge, and will feed on nectar, mate and lay eggs on the host plants. After hatching, the larvae spend a few weeks feeding on the leaves and stems of the host plants before entering dormancy until the following spring when they will complete their life cycle. The adult flight season typically extends from as early as late March to as late as early July.

Much of the historic habitat for this species has been lost, primarily to urban development and agriculture. However, other human disturbances such as off-road bicycle and vehicle use and the introduction of non-native invasive plants have contributed to the loss of their habitat as well. The

[38] Mueller, T.L., *Guide to the Federal and California Endangered Species Laws*, 1994, Planning and Conservation League, Sacramento, California.

Mission blue butterfly is now restricted to small, fragmented populations in Marin, San Francisco and San Mateo counties.

There are two occurrence records for Mission blue butter fly near the project area. The first is a record from 1985, CNDDB Occurrence #8, which is presumed extinct. The area of this occurrence overlays the entire project area, though information is not provided as to where within that polygon the observation occurred. However, it would be accurate to say that this population occurs within one mile of the project area. The second (and next nearest) record occurs approximately six miles to the south on the San Francisco Peninsula. This record is from 2001, and is CNDDB Occurrence #92 which is also presumed extant. Previously documented populations of silver lupine occur at the top of the hill north of the Alexander Avenue Road cut, but these well lie outside of the area of direct disturbance.

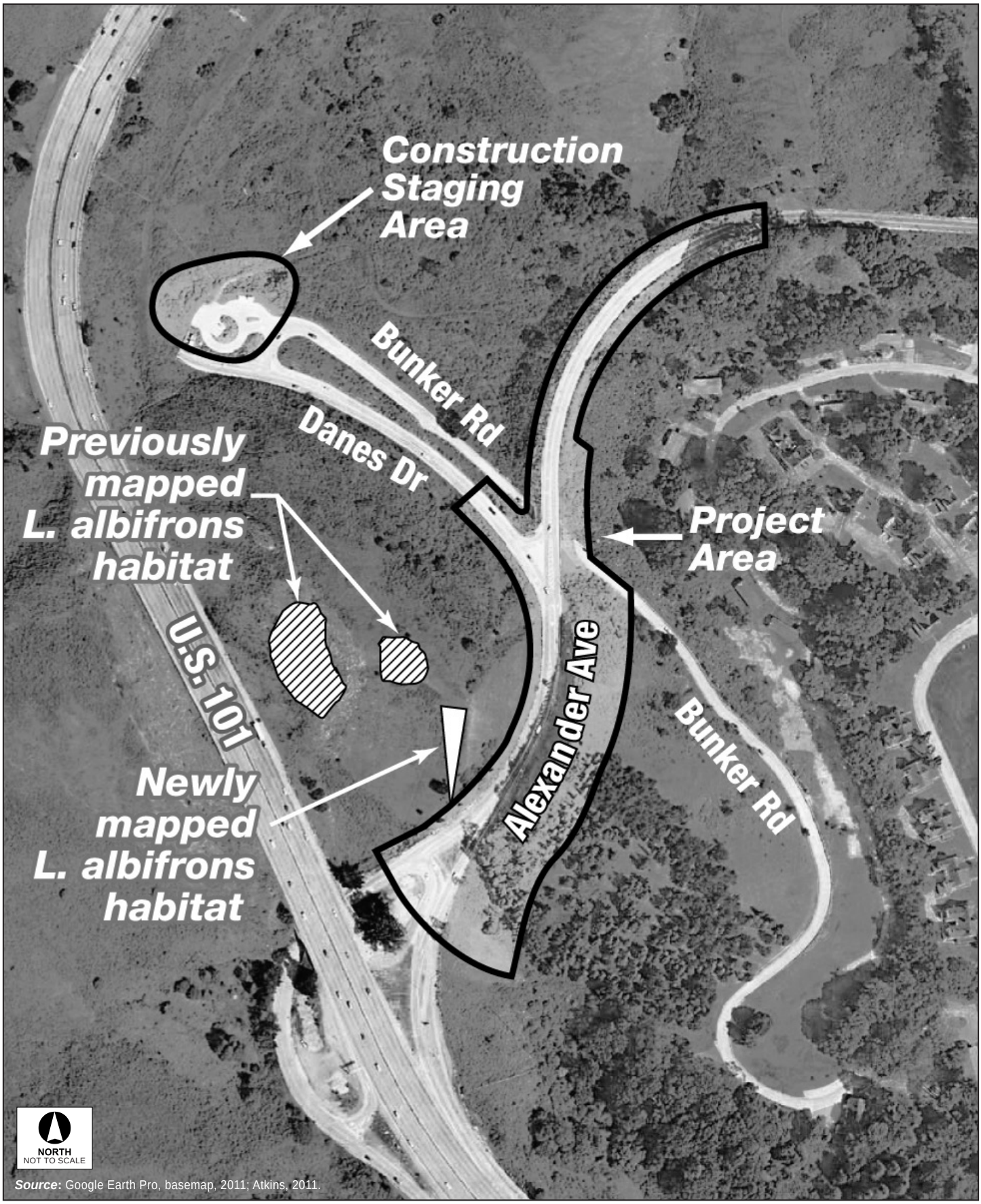
A survey of the project area for mission blue butterfly habitat was conducted on March 10, 2011 and March 11, 2011 by NPS biological technician Chris Perry. The survey area covered the entire project area plus a 150 buffer (Figure 3-6). Accessible areas of the site were surveyed on foot, and areas of steep inaccessible slopes the site were surveyed with binoculars. No mission blue butterflies were observed during the survey. Additionally, no mission blue butterfly habitat was observed within the survey area boundaries. However, a previously unmapped population of silver lupine was observed just outside the survey area boundary near the aforementioned populations on the west side of the Alexander Avenue road cut.

According to the TIMP EIS, no other special status species have the potential to occur within the project area.

3.11.4 Methodology

Impacts to special status species in and surrounding the project area would be associated with short-term construction activities. Long-term operation of the proposed project would not change the volume of traffic at the Alexander Avenue/Danes Drive intersection nor would it modify the footprint of the intersection and roadways to an extent that undeveloped land would become developed. The proposed project would be constructed within the existing right-of-way of Alexander Avenue and Danes Drive and would primarily consist of the modification of a previously disturbed area. Therefore, the analysis presented below focuses on short-term, construction-related effects, while long-term operation effects are not considered further.

Methodology for Analyzing Impacts on Special Status Species. The impact analysis for special status species included quantification of habitat types that would be lost or restored, and discussion of other potential local and regional effects. Special status species addressed are based on the USFWS species list and updates obtained for the project, and they include plants and animals that are legally protected or that are otherwise considered sensitive by federal, State, or local resource conservation agencies and organizations. These include species that are State and/or federally listed as endangered, threatened, or rare; those considered as candidates or proposed for listing; and species identified by CDFG and/or USFWS as species of concern. Impacts to designated critical habitat are also evaluated.



***Source*:** Google Earth Pro, basemap, 2011; Atkins, 2011.

100017371 | Alexander Ave-Danes Drive

Figure 3-6

Mission Blue Butterfly Habitat Survey Map

Potential impacts that could occur beyond the limit of direct project disturbance, including those that may not be related to habitat loss, are discussed on a qualitative basis. Impacts to special status species were assessed in terms of changes in the amount and connectivity of special status species habitat, integrity of the habitat (including past disturbance) and populations, and the potential for increased/decreased disturbance and number of individuals. All three of the action alternatives evaluated below may require nighttime construction. Nighttime construction would require the use of artificial lighting which could increase light and glare in the project area. Artificial lighting can lead to adverse impacts on wildlife, including special status species. However, this impact would be temporary and Mitigation Measure BIO-4, described below, would be incorporated into all three action alternatives to ensure adverse impacts to special status species related to light and glare are negligible.

The following intensity levels were defined for special status species:

- *Negligible:* No measurable or perceptible changes would occur to the amount, distribution, connectivity, or integrity of suitable habitat or individuals of special status species.
- *Minor:* Effects would be barely measurable or barely perceptible, would be localized within a relatively small area, and would affect few individuals of any special status species. There would be no overall effect to the connectivity of habitat or the integrity of habitat or populations. There would be no loss of special status species or critical habitat.
- *Moderate:* Effects would be measurable and perceptible or would occur over a large area. Effects could result in a loss or increase of individuals of a special status species or habitat, but there would be no loss of federally listed species or critical habitat. Changes in connectivity and integrity of suitable habitat would not permanently affect the integrity of a local population. Implementation of impact avoidance/minimization measures and/or restoration or enhancement of previously lost or degraded habitat within the park could be implemented as mitigation.
- *Major:* Effects could result in the loss or gain of a large number of individuals. Potential loss or gain in numbers of federally listed species. Changes in connectivity and integrity of suitable habitat could permanently affect the integrity of a local population, and there could be loss of critical habitat. Impacts could not be mitigated.

3.11.5 Alternative A: No Action Alternative

Implementation of Alternative A would leave the project area unchanged and no construction activities would be required under this alternative. Therefore, Alternative A would have no effect on special status species and their habitat within the project area.

Cumulative Effects. Alternative A would have no effect on special status species and their habitats within the project area or the surrounding GGNRA. As such, this alternative would have no effect on cumulative conditions.

Conclusion. Alternative A would have no effect on special status species within the project area or surrounding GGNRA.

3.11.6 Alternative B: 16-Foot Catchment Alternative

Alternative B would result in extensive ground-disturbing construction activities including, but not limited to, cut, and fill operations, grading, and installing micropiles. Under this alternative, the existing Alexander Avenue roadway would be reconstructed and the Alexander Avenue/Danes Drive intersection would be reconfigured from a "Y" intersection to a "T." To accommodate the widening of Alexander Avenue a new cut slope would be established along the east side of the existing rock cut between the US 101/Alexander Avenue interchange and the Danes Drive intersection. No excavation or other work would occur on the face of the road cut on the west side of Alexander Avenue; therefore, there would be no direct disturbance or loss of mission blue butterfly habitat. Indirect impacts could occur during and after construction through the generation of dust, introduction of non-native invasive plants, and trampling from off trail bicycle and foot traffic. Adherence to the mitigation measures described below would ensure that adverse effects on mission blue butterfly habitat would be reduced to a local, short-term, negligible level.

Cumulative Effects. The EIS completed for the TIMP included the transportation improvements under consideration as part of the proposed project as a transportation element of the Fort Baker Plan. The EIS cumulative analysis determined that the roadway improvements included in the TIMP would not result in adverse cumulative effects related to special status species. Therefore, Alternative B would also not result in adverse cumulative effects related to special status species.

Conclusion. After implementing mitigation measures intended to reduce construction-related impacts to the mission blue butterfly and special status species in general, Alternative B would have a local, negligible, adverse effect.

3.11.7 Alternative C: 5-Foot Catchment Alternative

Alternative C would result in similar ground-disturbing construction activities and equipment as Alternative B. Furthermore, Alternative C would adhere to the mitigation measures identified for Alternative B; therefore, Alternative C would result in the same local, short-term, negligible, adverse effects on special status species within and surrounding the project area.

Cumulative Effects. The cumulative effects of Alternative C would be the same as described under Alternative B.

Conclusion. Alternative C would result in local, negligible, short-term, adverse effects on special status species within and surrounding the project area.

3.11.8 Alternative D: 8-Foot Catchment Alternative

Implementation of Alternative D would result in the same ground-disturbing construction activities and equipment as described for the previous two action alternatives. Furthermore, Alternative D would adhere to the mitigation measures identified below. Therefore, Alternative D would result in the same local, short-term, negligible, adverse effects on special status species within and surrounding the project area.

Cumulative Effects. The cumulative effects of Alternative D would be the same as the previous two action alternatives.

Conclusion. Alternative D would result in local, negligible, short-term, adverse effects on special status species within and surrounding the project area.

3.11.9 Mitigation Measures

The following mitigation measures would ensure that implementation of the proposed project would not adversely affect mission blue butterfly habitat.

*BIO-1 Avoid Dust Accumulation on Mission Blue Butterfly Habitat***.** NPS or its contractor shall ensure that dust is controlled during construction by periodically watering down construction areas within 100 feet of mission blue butterfly habitat as necessary. Watering down the construction area would prevent dirt from becoming air borne and accumulating on larval host plants and adult food source plants for mission blue butterfly.

BIO-2 Fence/Flag and Monitor Mission Blue Butterfly Habitat. A qualified biologist shall supervise the installation of flagging or fencing around stands of known mission blue butterfly host/food plants and species that can be avoided within the limits of work. Fencing/flagging shall be installed before to any ground disturbing or vegetation removal activities. The fencing/flagging shall be placed the maximum distance from the plants possible (up to 100 feet), while still allowing work to occur in the adjacent area. The location of the flagging/fencing shall be field adjusted by the biological monitor as necessary. The temporary fencing/flagging shall be furnished, constructed, maintained, and later removed as shown on the construction plans, as specified in the special provisions, and as directed by NPS. Temporary fencing/flagging shall be at least 4-feet-high and constructed of high visibility material (such as, orange, commercial-quality woven polypropylene, or similar material). No construction activities shall be permitted within the fenced/flagged area. Warning signs indicating the sensitivity of the area shall be attached to the fencing/flagging.

BIO-3 Biological Resources Education Program for Construction Crews and Biological Monitoring. Before any ground disturbing work (including vegetation clearing or grading) occurs in the construction area, an NPS-approved biologist shall conduct a mandatory biological resources awareness training for all construction personnel on federally listed species that could potentially occur onsite (mission blue butterfly). The training program shall be approved by an NPS-qualified staff member prior to implementation, if prepared by a consulting biologist. The environmental education program shall include a description, representative photographs, and legal status of each of the federally listed species; terms and conditions of the biological opinion; and the penalties for not complying with biological mitigation requirements. This

information shall be supplied to non-English speaking personnel in their native language as needed.

BIO-4 Minimize Light Pollution. Nighttime construction lighting shall include downward cast/shielded lighting and the use of minimal lighting techniques to reduce light pollution and potential impacts to biological resources.

3.12 Invasive Species

3.12.1 Introduction

This section describes the types of invasive species present within the project area and analyzes the proposed project's effect on invasive species. In addition, this section summarizes the applicable laws, regulations, and policies associated with the control of invasive species

3.12.2 Affected Environment

According to the TIMP, invasive weeds occur in scattered locations along roadsides and in other disturbed areas throughout the Marin Headlands and Fort Baker, including the project area. Among the most conspicuous are jubata grass (*Cortaderia jubata*), fennel (*Foeniculum vulgare*), iceplant (*Carpobrotus edulis*), thoroughwort (*Argeratina adenophora*), French broom (*Genista monspessulana*), and Scotch broom (*Cytisus scoparius*). Some herbaceous species, such as Italian thistle, and some tree species, such as acacia, eucalyptus, Monterey pine, and Monterey cypress, are also considered invasive weeds, due to their ability to spread naturally into native plant communities.

3.12.3 Regulatory Framework

Federal Noxious and Invasive Weed Laws. Several federal laws pertain to noxious and invasive weeds, including the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 as amended (16 USC §4701 et seq.), the Lacey Act as amended (18 USC §42), the Federal Plant Pest Act (7 USC §150aa et seq.), the Federal Noxious Weed Act of 1974, as amended by the Food, Agriculture, Conservation and Trade Act of 1990 ("Management of Undesirable Plants on Federal Lands," 7 USC 2814), and the Carlson-Fogey Act of 1968 (Public Law 90-583). Federal agencies are also concerned about invasive weed infestation and dispersal on private and public lands. The Bureau of Land Management and the U.S. Department of Agriculture maintain lists of pest plants of economic or ecological concern.

Executive Order 13112. Executive Order 13112 directs all federal agencies to prevent and control introductions of invasive nonnative species in a cost-effective and environmentally sound manner to minimize their economic, ecological, and human health impacts. The order established a national Invasive Species Council that is made up of federal agencies and departments and a supporting Invasive Species Advisory Committee composed of State, local, and private entities. These groups oversee and facilitate implementation of the executive order, including preparation of a national invasive species management plan.

3.12.4 Methodology

The following thresholds were used in determining impacts on invasive plant species:

- ***Negligible*:** Alternative would result in no noticeable changes in the area on invasive plant species.
- ***Minor*:** Alternative would result in small but noticeable change and establishment of invasive plants.
- ***Moderate*:** Alternative would result in easily noticeable change and establishment of invasive plant species.
- ***Major:*** Alternative would result in highly noticeable change and establishment of invasive plant species.

3.12.5 Alternative A: No Action Alternative

Under Alternative A, no construction activities would occur. Therefore, no related impacts concerning the spread of invasive species would occur.

Cumulative Effects. Alternative A would have no effect on invasive species within the project area or the surrounding GGNRA. As such, this alternative would have no effect on cumulative conditions.

Conclusion. Alternative A would have no effect on invasive species within the project area or surrounding GGNRA.

3.12.6 Alternative B: 16 – Foot Catchment Alternative

Construction activities could result in the spread of existing invasive nonnative plants and the potential introduction of new invasive weeds from construction equipment, particularly in areas that have been previously undisturbed. Best management practices, as well as adherence to Mitigation Measure BIO-4, described below, would ensure that all equipment would be cleaned before entering sensitive areas or moving between construction sites. All existing infestations within the project area would be mapped before construction began, and to the greatest degree practicable these areas would be controlled prior to construction disturbance. Although the area of construction is not heavily vegetated, removing and controlling invasive nonnative plant species, including the eucalyptus trees described in Section 2.2.2.5, that are present would have a local, long-term, minor, beneficial effect. Furthermore, federal agencies are mandated by Executive Order 13112 (“Invasive Species”), described above, to prevent the spread of invasive species.

Cumulative Effects. As described above, federal agencies are mandated by Executive Order 13112 among other federal laws to prevent the spread of invasive species. Therefore, implementation of Alternative B along with other roadway rehabilitation projects within the GGNRA Marin Headlands area identified in the TIMP, the Fort Baker Plan, and the Draft Alexander Avenue Planning Study would not result in the spread of invasive species. Alternative B would have no cumulative effect on invasive species.

Conclusion. Implementation of Alternative B would have a local, long-term, minor, beneficial effect on invasive species through the removal of existing invasive species within the project area.

3.12.7 Alternative C: 5-Foot Catchment Alternative

Although implementation of Alternative C would result in reduced excavation of the east slope along Alexander Avenue compared with Alternative B, it would affect the same vegetated area. Alternative C would include the same best management practices, as well as adherence to Mitigation Measure BIO-5, as discussed below and would adhere to the federal legislation associated with the prevention of invasive species propagation (identified under Regulatory Framework, above). However, Alternative C would have the potential for increased long-term establishment of invasive plants due to the installation of rockfall mesh, which would inhibit control efforts. Therefore, Alternative C would result in long-term, local, minor, adverse effects on invasive species.

Cumulative Effects. The cumulative effects of Alternative C would be the same as described for Alternative B, above.

Conclusion. Alternative C would result in local, long-term, minor, adverse effects on invasive species.

3.12.8 Alternative D: 8-Foot Catchment Alternative

With the exception of the 8-foot rockfall catchment ditch, installation of a temporary barrier, and the amount of excavated material, Alternative D would include the same construction activities and overall footprint as the previous two action alternatives. As such, implementation of Alternative D would affect the same vegetated area as the previous two action alternatives. Alternative D would adhere to the best management practices described for Alternative B, above, and would adhere to Mitigation Measure BIO-5, discussed further below. In addition, Alternative D would be compliant with federal legislation associated with the prevention of invasive species propagation (identified under Section 3.12.3, Regulatory Framework, above). Therefore, Alternative D could result in long-term, minor, beneficial effects on invasive species, similar to Alternative B.

Cumulative Effects. The cumulative effects of Alternative D would be the same as described for the previous two action alternatives.

Conclusion. Alternative D would result in local, long-term, minor, beneficial effects on invasive species.

3.12.9 Mitigation Measure

The following mitigation measure would ensure that implementation of the proposed project would not result in an adverse effect related to the spread of invasive species.

BIO-5 Minimize the Introduction and Spread of Invasive Plants. To avoid or minimize the introduction or spread of invasive plants during construction activities, the following measures shall be implemented:

- NPS approved weed-free, erosion-control materials (or rice straw in upland areas) shall be used exclusively.

- The biological monitor shall educate the construction supervisors and managers about problems created by noxious weeds and the importance of controlling and preventing their spread. The biological monitor shall conduct a tailgate meeting before construction begins and shall distribute handouts identifying noxious weeds and describe the techniques used to prevent their spread. Noxious weed education could be conducted at the same time the biological resources education program (Conservation Measure 1) is conducted.

- To reduce the spread of invasive plants into uninfested areas, the contractor shall stockpile and cover topsoil removed during excavation.

- Equipment shall be cleaned to minimize spread of invasive species when moving from offsite to the watershed.

To reduce the likelihood of the introduction or spread of invasive plants during operations and routine maintenance activities, NPS shall implement the following operations and maintenance protocol:

- Crews shall receive training regarding problems created by invasive plants and the importance of controlling and preventing their spread.

- Activities shall be limited to as small a footprint as possible.

- Vehicles shall stay on designated access roads. Off-road vehicle traffic shall be prohibited unless required in an emergency.

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