Chapter 2 **Alternatives**

2.1 Introduction

NEPA requires federal agencies (and agencies receiving federal funds) to conduct a careful, complete, and analytical study of the impacts of proposals that have the potential to affect the environment, and consider alternatives to that proposal well before any decisions are made. Federal agencies are also required to involve interested or affected members of the public in the NEPA process. This EA assists NPS in decision making and determining if the potential for significant effects exists and if an EIS is required. An EA must identify technically feasible alternatives that meet the objectives of the proposed project.

This section describes the alternatives considered, including the No Action Alternative and three action alternatives. The alternatives described include specific requirements proposed to minimize or avoid environmental impacts. This section also includes a description of alternatives considered in the process but eliminated from further evaluation; and why they were eliminated.

2.1.1 Project Limits

The proposed project was initially formulated in the ROD for the Fort Baker Plan EIS. The proposed project was included in the ROD as an Offsite Transportation Enhancement intended to improve existing conditions at the Alexander Avenue/Danes Drive intersection. Further, the Fort Baker EIS determined that the Alexander Avenue/Danes Drive intersection could be adversely affected by increased traffic associated with implementation of the Fort Baker Plan and improvement of the intersection would help to alleviate a future increase in congestion. The proposed project was further defined in both the Marin Headlands and Fort Baker TIMP EIS and in the Draft Alexander Avenue Planning Study. The project limits on Alexander Avenue are immediately north of the US 101 interchange and immediately south of the Alexander Avenue/Danes Drive intersection. The project limits also include approximately 200 feet of Danes Drive between Alexander Avenue and East Bunker Road, and the Alexander Avenue/Danes Drive intersection. These limits form the logical termini for the proposed project since they include all approaches to the Alexander Avenue/Danes Drive intersection.

The proposed project has independent utility as a stand-alone component of identified roadway improvements needed in the Alexander Avenue corridor. Implementation of the proposed project would improve operation of the Alexander Avenue/Danes Drive intersection by reconfiguring the geometry of the intersection, lengthening the deceleration zone and left turn lane along Alexander Avenue, and widening the roadway shoulders through the rock cut. Implementation of the proposed project would satisfy the offsite transportation enhancement outlined in ROD for the Fort Baker Plan EIS. Construction of the proposed project would not restrict consideration of alternatives for future roadway improvements throughout the Alexander Avenue corridor. Such improvements have been identified in the Draft Alexander Avenue Planning Study.

2.2 Description of Alternatives

2.2.1 Alternative Development Process

NPS and the Federal Highway Administration (FHWA), Central Federal Lands Highway Division (CFLHD) developed and refined the three action alternatives. The alternatives were evaluated through an internal planning process that included careful review and analysis of site data, agency management objectives, and input received during scoping. Additionally, NPS and FHWA adhered to a formal decision-making process known as choosing by advantages (CBA). Ultimately, three action alternatives and a no action alternative were developed for the proposed project. Alternative B, which proposes a 16-foot wide rockfall catchment ditch, was proposed as a means of satisfying the purpose and need of the proposed project while limiting effects to aesthetic and cultural resources. In comparison, Alternative C, which would result in a 5-foot wide rockfall catchment ditch, was proposed to reduce the loss of geologic resources associated with Alternative B while still meeting the proposed project's purpose and need. During the alternative development process it was noted that Alternative C could potentially result in aesthetic and cultural resource impacts and long-term maintenance issues associated with the required rockfall mesh. As a compromise between Alternative B and Alternative C, an 8-foot wide rockfall catchment ditch was proposed as Alternative D which would strike a balance between loss of geologic resources and aesthetic, cultural resource, and maintenance concerns. The components of the project alternatives are further described below and their individual effects on environmental resources are described in Chapter 3, Environmental Consequences. The Agency Preferred Alternative resulted from this process and was designed to meet the proposed project's purpose, need, and objectives, as described in Chapter 1, Purpose of and Need for Action.

To acquire the baseline data needed to develop informed and appropriate alternatives for the Alexander Avenue/Danes Drive Intersection Improvement Project, NPS commissioned and/or participated in several studies in the GGNRA, and relied on information provided in related environmental review documents. In particular, development of the action alternatives relied on background information and analysis conducted in the Fort Baker Plan EIS, the Marin Headlands and Fort Baker TIMP EIS, and the Draft Alexander Avenue Planning Study. Relevant information from these documents was used to identify areas of environmental concern that were then considered during the alternatives development process.

2.2.2 Alternatives

The following four alternatives for the Alexander Avenue/Danes Drive Intersection Improvement Project are evaluated in this EA.

- Alternative A: No Action Alternative
- Alternative B: 16-Foot Rockfall Catchment Alternative
- Alternative C: 5-Foot Rockfall Catchment Alternative
- Alternative D: 8-Foot Rockfall Catchment Alternative

This chapter consists of a detailed description of the alternatives being considered and the alternatives eliminated from further study.

For Alternative A (the No Action Alternative) NPS and GGBHTD would not proceed with improvements to the Alexander Avenue/Danes Drive intersection. However, other roadway improvements outlined in the TIMP and transportation demand management (TDM) programs specified in the Fort Baker Plan EIS and subsequent ROD would be implemented.

For Alternative B, Alternative C, and Alternative D (the three action alternatives), the Alexander Avenue/Danes Drive intersection would be reconfigured and Alexander Avenue would be widened to provide an improved left-turn lane and multi-use shoulders along the roadway within the project limits. Northeast of the US 101 interchange, Alexander Avenue passes through an engineered cut in the hillside, characterized by steep, exposed rock slopes on the west and east sides of the roadway. A new cut slope would be required to provide adequate roadway width for constructing shoulders for bicyclists and pedestrians along this section of Alexander Avenue. Alternative B, Alternative C, and Alternative D provide three distinct options for the design of the rock cut that would be necessary to widen Alexander Avenue. The three action alternatives and the components of the proposed project common to all of the action alternatives are described below.

Design for the roadway and intersection improvements for the action alternatives is based on the California Department of Transportation (Caltrans) Highway Design Manual. The Caltrans Highway Design Manual establishes uniform policies and procedures to carry out the highway design functions of Caltrans. The policies contained in the Caltrans Highway Design Manual are for the information and guidance of Caltrans, as well as external agencies that use or choose to adopt this guidance.[1] The standards established in the Caltrans Highway Design Manual are derived from the American Association of State Highway and Transportation Officials (AASHTO) Geometric Design of Highways and Streets (Green Book), and tailored to the unique conditions present in California.

2.2.2.1 Alternative A: No Action Alternative

NEPA requires evaluation of the environmental consequences of a No Action Alternative. This alternative represents future conditions within the project area without implementation of the action alternatives. For Alternative A, use of the intersection would continue without the necessary design modifications, and the project area would remain in its current condition. Because Alternative A anticipates future conditions in the context of existing conditions, it is possible that other actions may take place and projects may be constructed and implemented in the foreseeable future that could affect environmental resources absent the proposed project. NEPA requires the disclosure of effects that foreseeable actions may have on environmental resources. These effects are discussed in Chapter 3, Environmental Consequences.

[1] Caltrans, *Highway Design Manual*: *Foreword*, July 24, 2009, website: http://www.dot.ca.gov/hq/oppd/hdm/pdf/english/fwd.pdf, accessed August 11, 2011.

For Alternative A, the existing configuration of Alexander Avenue immediately south of Danes Drive would persist as well as the skewed configuration of the right turn lane from Danes Drive onto Alexander Avenue. Under existing conditions, Alexander Avenue contains three 12-foot-wide lanes (two travel lanes and one left turn lane). The existing 1- to 3-foot wide shoulders along Alexander Avenue would continue to contribute to potential conflicts among bicycles, pedestrians, transit, and vehicle access and movements within the Alexander Avenue corridor. In addition, the left turn lane from Alexander Avenue to Danes Drive would continue to provide insufficient queuing capacity and deceleration length under peak hour traffic conditions for vehicles turning left onto Danes Drive. The No Action Alternative describes the action of continuing the present operation and maintaining the existing condition of the Alexander Avenue/Danes Drive intersection; it does not imply discontinuing the present operation or removing existing uses. The No Action Alternative provides a basis for comparing the management direction and environmental consequences of the action alternatives and must be considered in every EA.

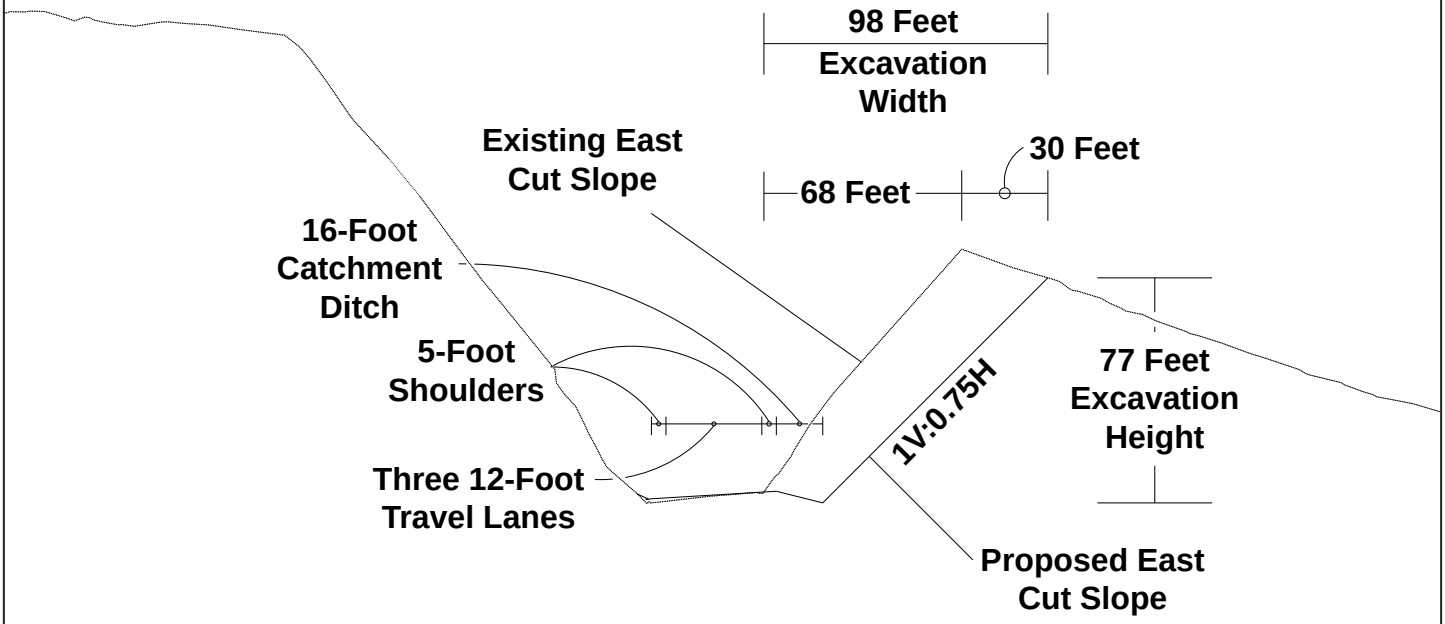
2.2.2.2 Alternative B: 16-Foot Rockfall Catchment Alternative

For Alternative B, the east-side slope would be cut to a sufficient depth to accommodate two 12-foot-wide vehicle lanes, a 12-foot-wide left turn lane, a 16-foot rockfall catchment ditch along the east side of Alexander Avenue and a 5-foot-wide combined shoulder and bicycle lane on both sides of the roadway. A 16-foot rockfall catchment ditch would eliminate the need to cover the new cut slope with rockfall mesh. The design for the rockfall catchment ditch under Alternative B is based on guidance from the Oregon Department of Transportation's Rockfall Containment Design Guide[2] and computer modeling using the Colorado Rockfall Simulation Program. Using these sources it was determined that with a 16-foot catchment ditch, rockfall mesh would not be necessary to provide an adequate level of rockfall containment.

A 2-foot-wide paved ditch would be constructed along the west side of Alexander Avenue to facilitate drainage and provide minimal area for rockfall and landslide material. The final height of the east slope would be approximately 77 feet and the total width of excavation would be approximately 98 feet after implementation of Alternative B. It is estimated that this alternative would result in the excavation of approximately 26,500 cubic yards (CY) of material. Figure 2-1 provides a cross-sectional view looking north along Alexander Avenue of the proposed rock cut for Alternative B, including slope angles, finished slope height, and width of excavation.

Construction of Alternative B would take approximately 3 to 4 months and would be completed in four separate phases. The first phase would involve the excavation of the existing rock cut along the east slope Alexander Avenue. Because implementation of the rock cut would vary among the action alternatives, construction activities for the first phase would be specific to each alternative. Construction of phases two through four are described under Elements Common to All Action Alternatives, below.

[2] Oregon Department of Transportation, *Rockfall Containment Design Guide, Chapters 4-5,* November, 2001.



Alternative B 16-foot Catchment

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

100017371 | Alexander Ave-Danes Drive

Figure 2-1
Alternative B Cross Section

It is anticipated that excavation of the east slope rock cut would take approximately 1 month to complete and would primarily be accomplished through the use of typical excavator equipment. Hand-operated and self-propelled rock drills would be used for rock excavation. Cranes would be used to lift or lower material and equipment to work areas in long-reach areas such as the top of the east slope. Blasting may be required for areas of harder rock in isolated areas. This would involve drilling vertically into the rock, loading the drilled hole with explosives, and detonating the explosives to blast the rock from the rock face. Alexander Avenue would be closed during the blasting operations. The excavated rock material would be collected by loaders and bulldozers and removed from the site by dump truck. To reduce the wasting 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 road cut material on projects within 10 miles driving distance from the proposed project. The remainder of the material is anticipated to require disposal outside of the park. Compliance will be handled separately for the projects that will receive earth materials from the Alexander Avenue/Danes Drive Intersection Improvement Project.

Blasting operations (if required) would be performed at night to limit traffic delays. During blasting operations, Alexander Avenue would be closed to through traffic within the project limits and traffic would be detoured during the blasting operations (refer to Section 3.3, Transportation, for more information regarding potential detour routes). The potential nighttime road closures would occur from the northbound US 101 off-ramp intersection to the Danes Drive intersection along Alexander Avenue. Night blasting would require additional safety precautions to insure the safety of the public and project personnel. These precautions would include monitoring by the contractor to prevent inadvertent public access to the blast zone and special effort by the blasting contractor to confirm the blast zone is safe after each blast.

Excavation of the rock cut would occur during the first phase of construction to provide additional space to ensure that one traffic lane in each direction could remain open during subsequent phases of construction. During this initial construction phase traffic would be routed to the furthest west section of the roadway.

2.2.2.3 Alternative C: 5-Foot Rockfall Catchment Alternative

For Alternative C, the east side slope would be cut to a sufficient depth to accommodate a 5-foot rockfall catchment ditch along the east side of Alexander Avenue. Consequently, rockfall mesh would be used extensively to cover the cut slope to prevent rock debris from falling onto the roadway. The design for the rockfall catchment ditch under Alternative C is based on guidance from the Oregon Department of Transportation's Rockfall Containment Design Guide and computer modeling using the Colorado Rockfall Simulation Program. Using these sources it was determined that with a 5-foot catchment ditch, rockfall mesh would be required to cover the majority of the east slope to provide an adequate level of rockfall containment. This alternative would allow for implementation of two 12-foot-wide vehicle lanes, a 12-foot-wide left turn lane, and a 5-foot-wide combined shoulder and bicycle lane on both sides of Alexander Avenue.

Implementation of Alternative C would result in a final east cut slope height of approximately 78 feet and the total width of excavation would be approximately 87 feet. Similar to Alternative B, a 2-foot-wide paved ditch would be constructed along the west side of Alexander Avenue to facilitate drainage

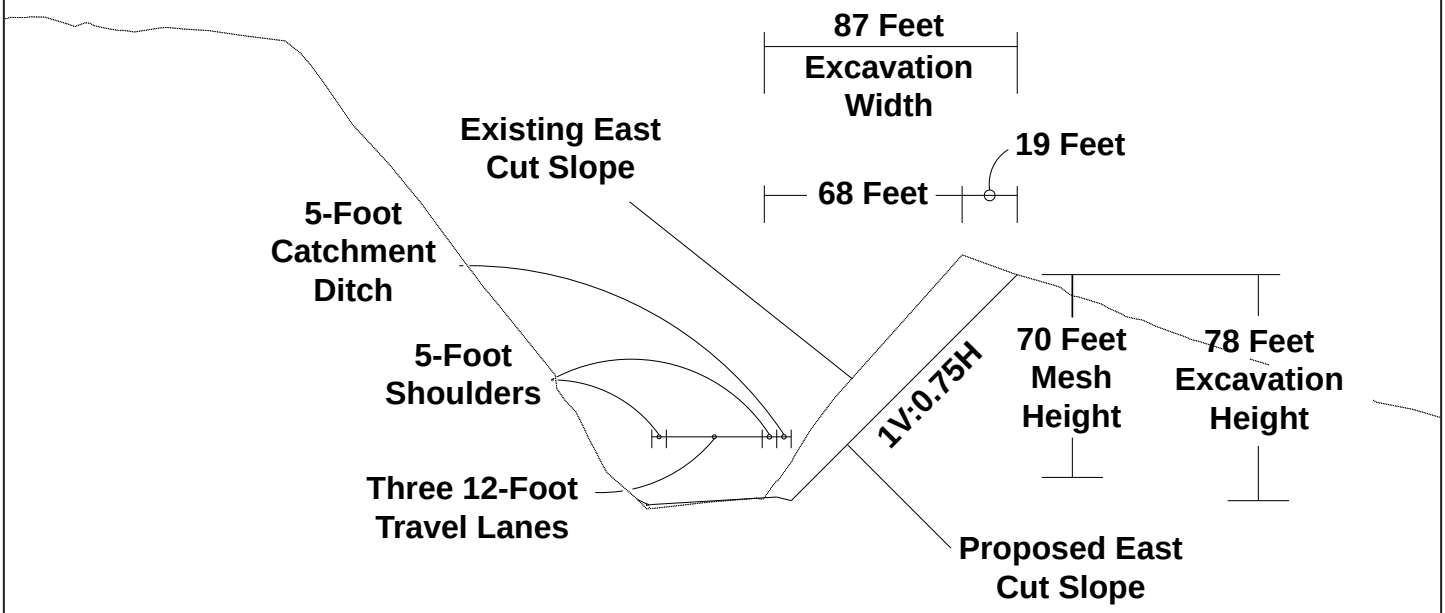
and provide minimal area for potential rockfall and landslide material. It is estimated that approximately 18,000 CY of material would be excavated from the east slope. To reduce the wasting of park geologic resources, as well as reduce the project impacts to air quality, GGNRA anticipates being able to utilize on the order of 10,000 CY of the road cut material on projects within 10 miles driving distance from the proposed project. The remainder of the material is anticipated to require disposal outside of the park. Compliance will be handled separately for the projects that will receive earth materials from the Alexander Avenue/Danes Drive Intersection Improvement Project. Figure 2-2 provides a cross-sectional view looking north along Alexander Avenue of the proposed rock cut for Alternative C, including slope angles, finished slope height, and width of excavation.

Construction activities and scheduling for Alternative C would be similar to those described under Alternative B above. However, because Alternative C would include rockfall mesh, the hand-operated and self-propelled rock drills used for rock excavation would also be used for installation of the rockfall mesh. To attach the rockfall mesh, anchors would be installed above the crest of the slope by drilling and grouting steel reinforcing bars into the rock and/or overburden materials. A crane would lift the sheet of mesh to the top of the slope where it would be attached to the anchors. The mesh would then hang over the slope. Numerous sheets of mesh would be required across the slope. The mesh sheets would then be connected together at the seams by personnel working from a crane or from ropes. Intermittent rock reinforcement consisting of steel bars grouted into holes drilled on the slope face could also be added at selected locations.

2.2.2.4 Alternative D: 8-Foot Rockfall Catchment Alternative

For Alternative D, the east side slope would be cut to a sufficient depth to accommodate an 8-foot rockfall catchment ditch along the east side of Alexander Avenue. A temporary concrete barrier would be installed along the east side of Alexander Avenue to prevent rockfall from entering the travel lanes. Following construction, the frequency, volume, dispersion, and size of rockfall events would be monitored by NPS and CFLHD quarterly for a minimum of two years. Data obtained from the monitoring program would be used to re-evaluate the rockfall hazard by modifying the Colorado Rockfall Simulation Program input parameters including rock size and shape, height of rockfall origination, slope roughness, and material properties. The refined program can be used to predict the percentage of rocks retained from typical rockfall events for the slope and catchment ditch conditions that exist after construction. The frequency and volume of rockfall events and the predicted percentage of rocks retained for an event would be used to select the appropriate permanent method necessary to reduce the potential for rockfall related accidents and property damage. Considerations for removal of the temporary barrier, possible installation of rockfall mesh, or installation of a permanent barrier include:

- Volume, dispersion, and size of fallen rocks in the catchment ditch recorded at quarterly intervals
- Location and severity of damage to temporary barrier
- Re-establishment of vegetation on slope
- Slope stability
- Recorded accidents and causes in the immediate area



Alternative C 5-foot Catchment

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

100017371 | Alexander Ave-Danes Drive

Figure 2-2
Alternative C Cross Section

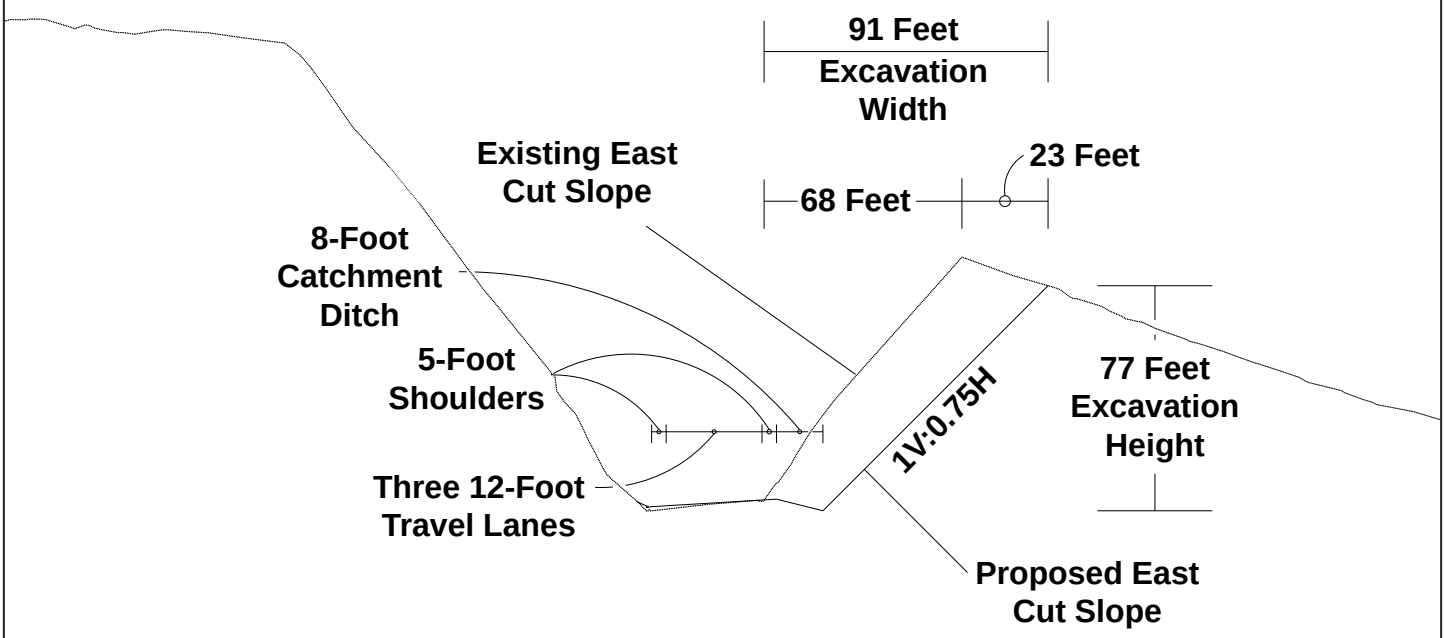
Any change to the temporary barrier (removal of the temporary barrier, possible installation of rockfall mesh, or installation of a permanent barrier) would be subject to a separate environmental evaluation (undertaken by NPS and CFLHD) prior to implementation.

Alternative D would allow for two 12-foot-wide vehicle lanes, a 12-foot-wide left turn lane, and a 5-foot-wide combined shoulder and bicycle lane on both sides of Alexander Avenue. This alternative would result in a final east cut slope height of approximately 77 feet and the total width of excavation would be approximately 91 feet. Similar to the other action alternatives, a 2-foot-wide paved ditch would be constructed along the west side of Alexander Avenue to facilitate drainage and provide minimal area for potential rockfall and landslide material. It is estimated that approximately 21,600 CY of material would be excavated from the east slope for Alternative D. To reduce the wasting 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 road cut material on projects within 10 miles driving distance from the proposed project. The remainder of the material is anticipated to require disposal outside of the park. Compliance will be handled separately for the projects that will receive earth materials from the Alexander Avenue/Danes Drive Intersection Improvement Project. Figure 2-3 provides a cross-sectional view looking north along Alexander Avenue of the proposed rock cut for Alternative D, including slope angles, finished slope height, and width of excavation.

Construction activities and scheduling for Alternative D would be similar to those described under Alternative B. If, after the two year rockfall monitoring period, NPS chooses to install rockfall mesh over the east cut slope along Alexander Avenue, installation of the rockfall mesh would require similar construction activities as described for Alternative C.

2.2.2.5 Elements Common to All Action Alternatives

Under any of the three action alternatives, improvements would be made to approximately 1,150 feet of Alexander Avenue north of the US 101 interchange and approximately 200 feet of Danes Drive between Alexander Avenue and East Bunker Road (see Figure 2-4). All of the action alternatives would add roadside shoulders to both sides of Alexander Avenue within the project limits in order to accommodate bicyclists and pedestrians outside of the travel lanes. The Alexander Avenue/Danes Drive intersection would be reconfigured from a "Y" intersection to a "T" intersection to improve the limited sight distance and overall operation of the intersection. The existing left turn lane from northbound Alexander Avenue to westbound Danes Drive would be lengthened to allow for improved deceleration in the turn lane and to increase storage capacity in accordance with current AASHTO design guidelines. The project area and the construction staging area are depicted in Figure 3-6 in Chapter 3, Environmental Consequences.



Alternative D 8-foot Catchment Ditch

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

100017371 | Alexander Ave-Danes Drive

Figure 2-3
Alternative D Cross Section

100017371 | Alexander Ave-Danes Drive

Figure 2-4
Proposed Roadway Configuration

Lengthening the left-turn lane and adding roadside shoulders along Alexander Avenue within the project limits would require widening the roadway. Widening Alexander Avenue would require two distinct construction components:

- Establishment of a new cut slope along the east side of Alexander Avenue between the US 101 interchange to the south and the intersection with Danes Drive to the north (described above); and
- Implementation of a retaining structure to support the placement of fill above the Bunker Road Arch Tunnel to allow widening of Alexander Avenue north of the Danes Drive intersection.

Widening Alexander Avenue over the Bunker Road Arch Tunnel north of Danes Drive would require special design considerations because the tunnel structure is inadequate to support the additional load of conventional earthen fill. These design considerations would be the same for both action alternatives. The Bunker Road Arch Tunnel is listed as a contributing structure to the Fort Baker, Barry, and Cronkhite Historic District; therefore, the action alternatives have been designed to minimize adverse effects to the Bunker Road Arch Tunnel. To allow for construction of the fill above the tunnel, a retaining structure supported on a micropile foundation would be constructed. The retaining structure and micropile foundation would be designed such that the integrity of the Bunker Road Arch Tunnel as a historic structure would not be compromised.

The components of the proposed project common to the three action alternatives would be constructed during phases two through four. The action alternatives would require construction equipment such as motor graders, excavators, bulldozers, rollers, dump trucks, and loaders. All construction staging would occur in the parking lot on the north side of Danes Drive between the Alexander Avenue/Danes Drive intersection and the Baker-Barry Tunnel (see Figure 3-6). Major construction features include:

- Construction of a retaining wall over the East Bunker Road tunnel
- Reconstruction of the roadway to reduce super elevation and widen shoulders
- Reconfiguration of the “Y” intersection to a “T” intersection

Construction during daylight hours would include the retaining wall, existing pavement removal, roadway grading, minor excavations, roadway lighting relocations, drainage, curb and gutter, guardrails, asphalt paving, and other minor miscellaneous work. Traffic during these daylight times would remain on Alexander Avenue with one-lane in each direction. The left turn lane onto Danes Drive would be temporarily closed to provide space for construction to occur. No daytime roadway closures of East Bunker Road are anticipated. During the second phase, the middle area of the Alexander Avenue roadway would be reconstructed to grade. Traffic would be split around the work zone. The third and final phase would reconstruct the west side of the roadway while traffic is on the newly constructed east side of the roadway.

During construction, bicyclists and pedestrians would be advised to travel through Fort Baker instead of along Alexander Avenue. The contractor would be required to provide access through the work zone for pedestrians and bicycles. Bicycles could either travel on the roadway or dismount and walk through the pedestrian zone. The transit stop along southbound Alexander Avenue at Danes Drive would be

temporarily relocated immediately adjacent to the existing stop while the existing stop is reconstructed. Construction activities would be coordinated with the City of Sausalito, Golden Gate Transit (GGT), and the Cavallo Lodge to minimize disruption to all modes of travel.

Erosion and sediment control would be completed with sediment logs, rock check dams, inlet protection, and erosion control matting. As part of erosion and sediment control BMPs, sediment logs would be made from biodegradable materials. Seeding would be done for permanent erosion control. Inlet filters have been installed in inlets for the Conzelman Road and Bunker/Mitchell Roads projects; it is anticipated inlet filters would also be included for the proposed project where appropriate. In addition, all three of the action alternatives would require the removal of a number of non-native and native shrubs and trees within the project limits. Trees to be removed include 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. Compliance with the Migratory Bird Treaty Act through implementation of best management practices (to include timing of removal outside of the nesting season, etc.) would minimize adverse affects to birds associated with tree and shrub removal (refer to Section 3.11, Special Status Species, for further details).

Implementation of any of the action alternatives would contribute to the goals and objectives of the TIMP and Draft Alexander Avenue Planning Study regarding rehabilitation of multiple sections of the Alexander Avenue corridor and overall improvement of the GGNRA Marin Headlands area transportation network. Further, implementation of any of the three action alternatives would fulfill the Offsite Transportation Enhancement identified in the Fort Baker Plan EIS for the Alexander Avenue/Danes Drive intersection.

2.3 Agency Preferred Alternative

As described under Alternative Development Process, above, NPS staff conducted a CBA process for the proposed project and consulted with GGBHTD. The CBA process compared the action alternatives against a number of factors including, but not limited to, geologic resources and natural habitats, visual resources, and traffic impacts. The factors were weighed individually in terms of their significance to fulfilling the purpose and need of the proposed project, as well as adhering to NPS management policies. Through the CBA process and consultation with GGBHTD it was determined that implementation of Alternative D (8-Foot Rockfall Catchment Alternative) would result in the greatest number of advantages because it would minimize construction-related impacts and the loss of geologic resources from excavation of the existing rock cut, while reducing the effects on cultural and visual resources by omitting the need for rockfall mesh. Further, because Alternative D would not require installation of rockfall mesh, maintenance associated with the clearing of rockfall debris would be reduced. For Section 106 purposes the agency preferred alternative (Alternative D) is the proposed undertaking.

2.4 Mitigation and Monitoring

Mitigation measures are specific actions designed to minimize, reduce, or eliminate impacts of alternatives and to protect GGNRA resources and visitors. Monitoring activities are actions to be implemented during or following construction. Table 2-1 describes the mitigation that would be done to minimize impacts of the proposed project.

Table 2-1
Mitigation Measures

Mitigation	Description
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 Bay Area Air Quality Management District (BAAQMD). The Project Sponsor shall include in [all construction contracts] the following requirements or measures: • All exposed surfaces (e.g., 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.[3]
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).
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 the mission blue butterfly.

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

Table 2-1
Mitigation Measures

Mitigation	Description
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 prior 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 (e.g., 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 will conduct a mandatory biological resources awareness training for all construction personnel on federally listed species that could potentially occur on site (i.e., mission blue butterfly). The training program will be approved by an NPS-qualified staff member prior to implementation, if prepared by a consulting biologist. The environmental education program will 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 will 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.
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: 1. NPS-approved weed-free, erosion-control materials (or rice straw in upland areas) shall be used exclusively. 2. 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. 3. To reduce the spread of invasive plants into uninfested areas, the contractor shall stockpile and cover topsoil removed during excavation. 4. 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: 1. Crews shall receive training regarding problems created by invasive plants and the importance of controlling and preventing their spread. 2. Activities shall be limited to as small a footprint as possible. 3. Vehicles shall stay on designated access roads. Off-road vehicle traffic shall be prohibited unless required in an emergency.
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 National Register of Historic Places (NRHP) in consultation with the State Historic Preservation Office (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.

Table 2-1
Mitigation Measures

Mitigation	Description
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 NPS personnel. Protocols under federal law shall apply for discoveries on federal land. The find shall be secured and protected in place. The Marin County coroner shall be notified in accordance with Section 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.
HAZ-1	*Underground Storage Tank Management.* If construction is 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 the 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 are confirmed, cleanup options shall be determined before construction.
HAZ-2	*Prepare Hazardous 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 is proposed, and where there are 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 of each project. 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 are found, 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 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 before to use in the park. • All heavy equipment in the park shall be required to carry emergency spill-containment materials. For example, pans shall be placed under equipment that is stored onsite 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.
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.

Table 2-1
Mitigation Measures

Mitigation	Description
NOI-2	*Employ Noise Reducing Construction Practices.* To reduce daytime noise and potential disturbance due to construction, contractors shall muffle or control noise from construction equipment by using the following measures: • Construction equipment and trucks shall use noise control techniques (such as improved mufflers, intake silencers, ducts, engine enclosures and acoustically attenuating shields or shrouds, and 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 (e.g., 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 used. 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.

2.5 Permit Requirements

The following permits and approval would be required before work can begin:

- A General Permit for Discharges of Stormwater Associated with Construction Activity (Construction General Permit Order 2010-0014-DWQ), pursuant to the NPDES regulations established under the Clean Water Act. This permit requires preparation, approval, and implementation of a Storm Water Pollution Prevention Plan (SWPPP), with oversight by the State Water Resources Control Board.

2.6 Alternatives Considered but Eliminated from Further Evaluation

The following alternatives were identified by NPS staff, but were later dismissed. As a result, these alternatives were not carried forward for evaluation in this document. This section briefly explains each alternative and the reason for its elimination. In general, these alternative elements were eliminated for one or more of the following reasons:

- The alternative would require construction and/or maintenance activities that are beyond the scope of the proposed project.
- The alternative does not meet the project purpose or resolve the project need to a large degree.
- The alternative would be inconsistent with project goals and objectives.
- The alternative would be technically or economically infeasible, or not implementable.
- A similar or better option is included in the alternatives (i.e., there is a less environmentally damaging, less expensive, or more optimal alternative) that would achieve the same result.

2.6.1 West Cut Alternative

To accommodate the widening of Alexander Avenue between the US 101 off-ramp and the Danes Drive intersection, a new cut slope on the west side of the existing rock cut was considered as a variant to the

east slope cut. The west slope is approximately 180 feet above the Alexander Avenue roadway (approximately 100 feet taller than the east slope); therefore, cut and fill operations on the west slope would result in a greater effect on geologic resources, substantially more waste material, and have a greater economic impact. In addition, due to the adverse geologic conditions of the west slope, the slope angle in the overburdened soils would have to be reduced (laid-back) compared to the existing slope.

Cutting the west slope to allow for the widening of Alexander Avenue would require extensive slope stabilization measures for the existing landslide features at the north and south ends of the cut in order to provide long-term geotechnical stability. Measures to mitigate rockfall hazard would be more extensive on the west slope than the east slope due to the greater height of the required cut. Long-term maintenance concerns associated with the west slope will be documented in the Draft Alexander Avenue Planning Study. The extensive slope stabilization measures required for implementation of West Cut Alternative make establishment of the new cut slope along the east slope a better option in terms of technical and economical feasibility.

2.6.2 Split East and West Cut Alternative

Another alternative was considered to split the cut between the east and west slopes in order to reduce the impact to either side. However, this alternative would require modifying the existing west slope angle and potentially installing of rockfall mesh along the east slope. As described for the West Cut Alternative above, construction activities on the west slope for cut and fill operations would result in a greater effect on geologic resources. Further, as described in Chapter 3, Environmental Consequences, either of the action alternatives would minimize adverse effects to natural, scenic, and historic resources in the Alexander Avenue corridor. Splitting the cut between the east and west slopes would result in a more severe alteration of the existing rock cut as compared with alternatives that limit the rock cut to a single slope. This alternative also would not meet the project purpose and need because a similar and more reasonable option is included in the alternatives considered for further evaluation. For these reasons, the Split East and West Cut alternative was eliminated from future consideration.

2.7 Environmentally Preferred Alternative

The Council on Environmental Quality (CEQ) Regulations implementing NEPA and the NPS NEPA guidelines require that "the alternative or alternatives which were considered to be environmentally preferable" be identified (CEQ Regulations, §1505.2). CEQ defines the environmentally preferred alternative as "the alternative that would promote the national environmental policy as expressed in NEPA §101." As stated in section 101(b) of NEPA, it is the continuing responsibility of federal agencies to:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
- Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;

- Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
- Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice;
- Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The proposed project's purpose and need (as described in Chapter 1, Purpose of and Need for Action) closely mirrors these criteria. The purpose and need for this project emphasize natural and cultural resource protection, as well as enhancing visitor experience and improving safety of park users. Because the goals and objectives of the proposed project correlate with these criteria, analyzing which alternative best meets the project purpose and need would also determine which alternative is environmentally preferred. Using this analysis approach, it was determined that Alternative C is the environmentally preferred alternative. Provided below is a summary of how the action alternatives meet the stated purpose of the proposed project. Because Alternative A (No Action) does not meet the project purpose and need, it is not the environmentally preferred alternative.

Although the components of the three action alternatives are similar, there are several aspects of Alternative D that make it stand out as the environmentally preferred alternative. All three action alternatives would enhance the safety of the Alexander Avenue/Danes Drive intersection by providing additional turn lane storage capacity and improved geometric configuration. Further, all three action alternatives would enhance multi-modal access through the Alexander Avenue corridor and would contribute to the improvement of the GGNRA Marin Headlands transportation network as envisioned in the TIMP. However (consistent with DO-12), the proposed project should also minimize adverse effects to the natural, scenic, and historic resources associated with the Alexander Avenue corridor. Alternative C would partially fulfill this goal by minimizing adverse effects related to the emission of air pollutants and the loss of geologic resources during construction activities. However, because Alternative C would establish a 5-foot rockfall catchment as opposed to the 16-foot rockfall catchment proposed under Alternative B or the 8-foot rockfall catchment proposed under Alternative D, rockfall mesh would be required to cover the exposed rock cut along Alexander Avenue. As described in Chapter 3, Environmental Consequences, the rockfall mesh would result in adverse effects on both the Forts Baker, Barry, and Cronkhite Historic District and Alexander Avenue as contributing features to the Historic District. Through these considerations, Alternative D was chosen as the environmentally preferred alternative. Alternative D would minimize adverse effects related to the emission of air pollutants and the loss of geologic resources during construction activities while also avoiding adverse effects to cultural resources.

2.8 Comparison of Alternatives

Table 2-2 provides a summary comparison of the project components proposed for each of the alternatives considered for further analysis.

Table 2-2
Comparison of Alternatives

Project Element	Alternative A No Action Alternative	Alternative B 16-Foot Rockfall Catchment Alternative	Alternative C 5-Foot Rockfall Catchment Alternative	Alternative D 8-Foot Rockfall Catchment Alternative
Intersection Reconfiguration	The existing configuration of the Alexander Avenue/Danes Drive intersection would remain unchanged	The existing intersection would be reconfigured from a "Y" configuration to a "T"	Same as Alternative B	Same as Alternative B and Alternative C
Cut Slope	The existing cut slope along Alexander Avenue would remain unchanged	The existing rock cut on the east slope would be excavated and a 16-foot rockfall catchment ditch would be constructed at the toe of the slope	The existing rock cut on the east slope would be excavated and a 5-foot rockfall catchment ditch would be constructed at the toe of the slope	The existing rock cut on the east slope would be excavated and an 8-foot rockfall catchment ditch would be constructed at the toe of the slope
Left Turn Lane Modification	The existing deceleration length and queuing capacity of the left-turn lane from Alexander Avenue to Danes Drive would remain unchanged	The existing left-turn lane would be lengthened to provide increased queuing capacity and deceleration length	Same as Alternative B	Same as Alternative B and Alternative C
Shoulders	The existing 1-3 foot roadside shoulders would remain unchanged	5-foot wide multi-use shoulder would be established on both sides of Alexander Avenue	Same as Alternative B	Same as Alternative B and Alternative C
Retaining Structure	Alexander Avenue would not be widened and therefore the retaining structure above the Bunker Road Arch Tunnel would be not be constructed	A retaining structure with micropile foundation would be constructed over the Bunker Road Arch Tunnel to support the widening of Alexander Avenue	Same as Alternative B	Same as Alternative B and Alternative C
Guardrail Replacement	The existing timber guardrails would remain in place	The existing timber guardrails would be replaced with steel-backed timber guardrails and painted white	Same as Alternative B	Same as Alternative B and Alternative C

2.9 Comparison of Impacts

Table 2-3 summarizes the potential long-term impacts of the proposed alternatives. Short-term impacts are not included in this table, but are analyzed in Chapter 3, Environmental Consequences. Impact intensity, context, and duration are also defined in Section 3.

Table 2-3
Comparison of Impacts

Impact Topic	Alternative A No Action Alternative	Alternative B 16-Foot Rockfall Catchment Alternative	Alternative C 5-Foot Rockfall Catchment Alternative	Alternative D 8-Foot Rockfall Catchment Alternative
Transportation	Local, Moderate, and Adverse	Local, Moderate, and Beneficial	Local, Moderate, and Beneficial	Local, Moderate, and Beneficial
Visual Resources	No Effect	Local, Minor, and Adverse	Local, Moderate, and Adverse	Local, Minor, and Adverse
Visitor Experience	Local, Moderate, and Adverse	Local, Moderate, and Beneficial	Local, Moderate, and Beneficial	Local, Moderate, and Beneficial
Cultural Resources	No Effect	Local, Minor, and Adverse	Local, Major, and Adverse	Local, Minor, and Adverse
Air Quality	No Effect	No Effect	No Effect	No Effect
Geologic Resources, Soils, and Seismic Hazards	No Effect	Geologic Resources: Local, Moderate, and Adverse Soils and Seismicity: Local, Minor, and Beneficial	Geologic Resources: Local, Moderate, and Adverse Soils and Seismicity: Local, Minor, and Beneficial	Geologic Resources: Local, Moderate, and Adverse Soils and Seismicity: Local, Minor, and Beneficial
Noise	No Effect	No Effect	No Effect	No Effect
Public Health and Safety	No Effect	Local, Negligible, and Adverse	Local, Negligible, and Adverse	Local, Negligible, and Adverse
Special Status Species	No Effect	No Effect	No Effect	No Effect
Invasive Species	No Effect	Local, Minor, and Beneficial	Local, Minor, and Adverse	Local, Minor, and Beneficial

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