Mojave National Preserve

U.S. Department of the Interior
National Park Service

Kelso-Cima Road and South Kelbaker Road Rehabilitation
Environmental Assessment

March 2025

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ACRONYMS AND ABBREVIATIONS

APE	area of potential effects
°C	degrees Celsius
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
concrete asphalt	asphalt
EA	environmental assessment
ESA	Endangered Species Act
°F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FFRMS	Federal Flood Risk Management Standard
FHWA	Federal Highway Administration
FSOF	Floodplain Statement of Findings
HD	historic district
I	Interstate
IPaC	Information for Planning and Consultation
mph	miles per hour
NAGPRA	Native American Graves Protection and Repatriation Act
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
Preserve	Mojave National Preserve
RSL&CC	Rock Spring Land and Cattle Company
SHPO	State Historic Preservation Officer
UPRR	Union Pacific Railroad
USACE	US Army Corps of Engineers
USEPA	US Environmental Protection Agency
USC	United States Code
USFWS	United States Fish and Wildlife Service
WOTUS	waters of the US

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CHAPTER 1: PURPOSE AND NEED

INTRODUCTION

The National Park Service (NPS) proposes to rehabilitate Kelso-Cima Road and South Kelbaker Road at Mojave National Preserve (Preserve) in San Bernardino County, California. Proposed rehabilitation of the roads would include demolishing and removing the existing road surface, installing a new road base, and reapplying the asphalt road surface. The NPS would maintain the existing low-water crossings on the roadways but would stabilize and armor them to prevent erosion. The NPS would also add roadway pullouts along both roads, improve access and safety, as well as offer visitors new opportunities to stop and learn about the Preserve. Additionally, the NPS would install features along Kelso-Cima Road and South Kelbaker Road to reduce desert tortoise (*Gopherus agassizii*) mortality and promote habitat connectivity. The Federal Highway Administration-Central Federal Lands Highway Division (FHWA-CFLHD) is a cooperating agency in the National Environmental Policy Act (NEPA) process and is providing design details and engineering expertise.

This document has been prepared in accordance with the revised 2024 Council on Environmental Quality regulations that were in effect at the time the project was initiated and follows the Council on Environmental Quality, *Memorandum for Heads of Federal Departments and Agencies,* released in February 2025 (CEQ 2025). This document is also consistent with the Department of Interior NEPA regulations and discloses the reasonably foreseeable impacts.[1]

This chapter of the document describes the reasons the NPS is proposing to rehabilitate Kelso-Cima Road and South Kelbaker Road. Specifically, this section describes the purpose of and need for the proposed action; project area and background; issues and resource topics retained for detailed analysis; and issues considered but dismissed from detailed analysis.

PURPOSE OF AND NEED FOR PROPOSED ACTION

The purpose of the project is to reduce the number and severity of automobile accidents and to improve visitor experience and access within the Preserve by addressing safety concerns and correcting structural and road design deficiencies along 42 miles of major Preserve roadways, while providing additional resource protections and increasing roadway resilience in the Preserve. Other project objectives include:

- Restoring roads to meet current condition standards by resurfacing and correcting design deficiencies.
- Improving road safety.
- Enhancing the visitor experience and access with better driving conditions and new amenities, including a welcome area and scenic pullouts.

[1] Executive Order 14154, Unleashing American Energy (Jan. 20, 2025), and Presidential Memorandum, Ending Illegal Discrimination and Restoring Merit-Based Opportunity (Jan. 21, 2025), require the NPS to strictly adhere to NEPA (42 United States Code [USC] §§ 4321 et seq.). Further, such Order and Memorandum repeal Executive Orders 12898 (Feb. 11, 1994) and 14096 (Apr. 21, 2023). Because Executive Orders 12898 and 14096 have been repealed, complying with such orders is a legal impossibility. The NPS verifies that it has complied with the requirements of NEPA, including the Department's regulations and procedures implementing NEPA at 43 Code of Federal Regulations (CFR) Part 46 and Part 516 of the Departmental Manual, consistent with the President's January 2025 Order and Memorandum.

- Installing exclusion fences to reduce wildlife mortality on Preserve roads.

This project is needed because the existing road system has exceeded its service life, and high rates of automobile accidents occur each year. Current road deficiencies, including sharp turns with poor sightlines, soft shoulders, and degraded asphalt conditions, contribute to avoidable traffic accidents each year. In addition, the project includes protections for desert tortoises to help reduce tortoise mortality in the Preserve.

PROJECT AREA

The project is located along Kelso-Cima Road and South Kelbaker Road, encompassing approximately 42 miles of roadway that bisect the central and southwestern portions of the 1.6 million acres of the Preserve. As shown in Figure 1, the project area begins at the intersection of Cima Road and Kelso-Cima Road, continuing along Kelso-Cima Road for approximately 19 miles to the intersection of Kelso-Cima and South Kelbaker Roads, where it continues along South Kelbaker Road for approximately 22 miles until the southern Preserve boundary. The Union Pacific Railroad (UPRR) right-of-way corridor parallels the project area and includes an at-grade crossing on South Kelbaker Road, near Kelso Depot. The project area is approximately 557 acres and includes two potential construction staging areas, located southwest of the project limits on South Kelbaker Road and near the intersection of Kelso-Cima and South Kelbaker Roads.

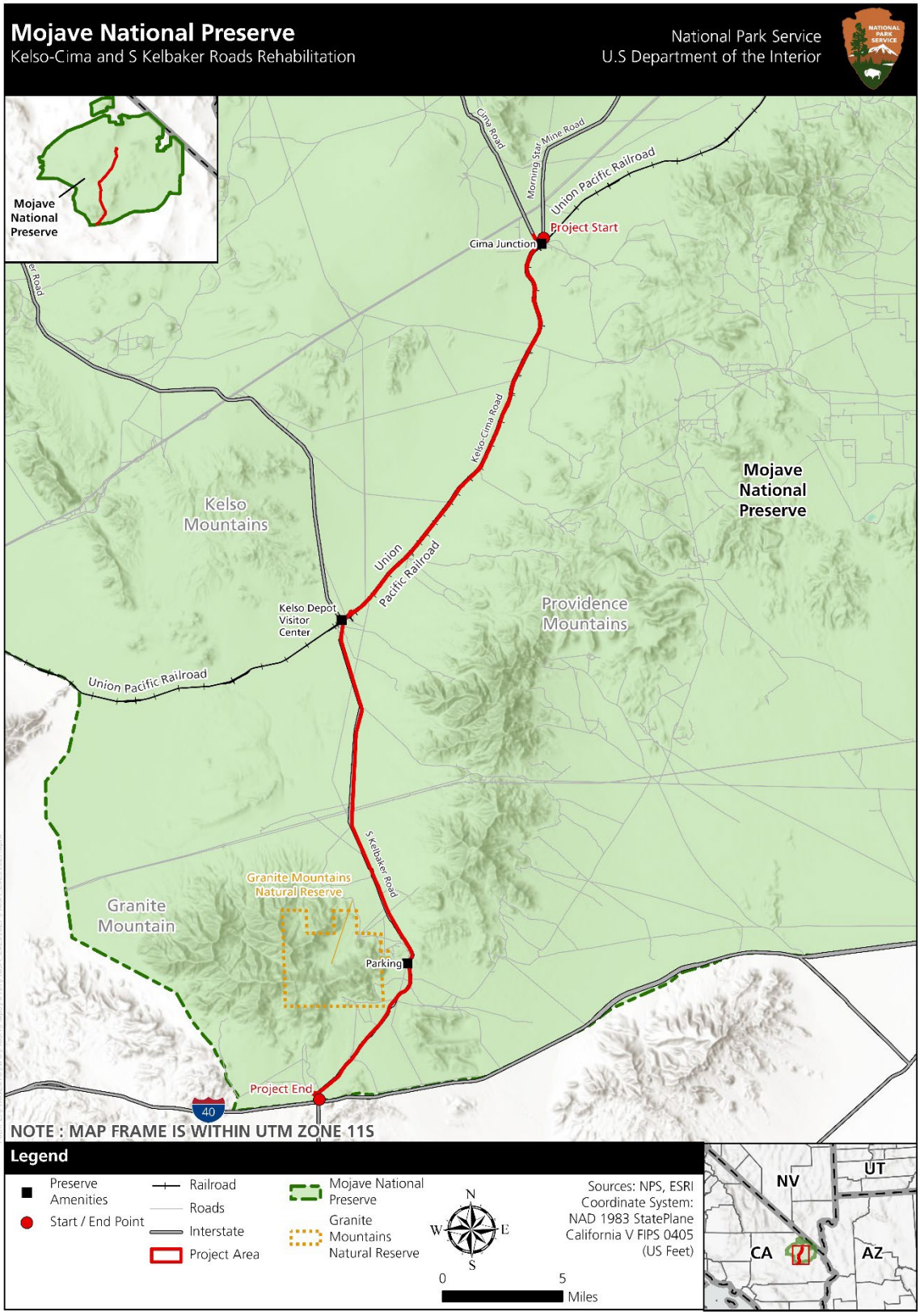

FIGURE 1. PROJECT AREA

BACKGROUND

The Preserve is a 1.6-million-acre unit of the NPS that was established by Congress on October 31, 1994, by the California Desert Protection Act. The Preserve protects ecological communities and functions, and evidence of a 10,000-year history of human connection with the desert. The Preserve is a vast expanse of desert lands that represents a combination of Great Basin, Sonoran, and Mojave Desert ecosystems. This combination allows visitors to experience a variety of desert plant life in combinations that exist nowhere else in such proximity in the United States. About 700,000 acres of the Preserve's 1.6 million acres is designated wilderness. In addition, about half is designated as critical habitat for the federally listed threatened desert tortoise (NPS 2013).

Interstates (I)-15 and 40 largely serve as the Preserve's northern and southern boundaries, while the Nevada–California border makes up most of the Preserve's eastern boundary. Primary Preserve roads bisect the area and form a major north–south route that connects Southern California to Las Vegas through this remote desert landscape. These roads include Kelbaker, Kelso-Cima, Cima, and Morning Star Mine Roads.

The Preserve's primary roads are heavily traveled, with average daily traffic counts ranging from 400 to more than 1,700 vehicles. Speed limits in the Preserve are up to 55 miles per hour (mph). However, the roads have a combination of sharp curves, elevation changes, and limited sight distances that can be dangerous for drivers who are not used to the terrain. In addition to these design deficiencies, the pavement is generally thin and has exceeded its service life. Although the roadway width is adequate in most locations, there are abrupt shoulder drop-offs, dips, and spalled asphalt pavement that contribute to safety issues (see Figure 2). The intersections of Cima Road, Kelso-Cima Road, and Morning Star Mine Road, and the intersection at Kelso Depot with South Kelbaker Road are located near UPRR grade crossings that block motorists' view of the approaching stop signs. These road conditions and design deficiencies have contributed to high accident rates and increased accident severity. As a result, the average accident rate is 31.2 fatal accidents per million vehicle miles traveled, primarily due to excessive speeds on the existing road design (UC Berkeley 2024). Additionally, wildlife road mortality is a pervasive issue in the Preserve, particularly for the federally listed desert tortoise.

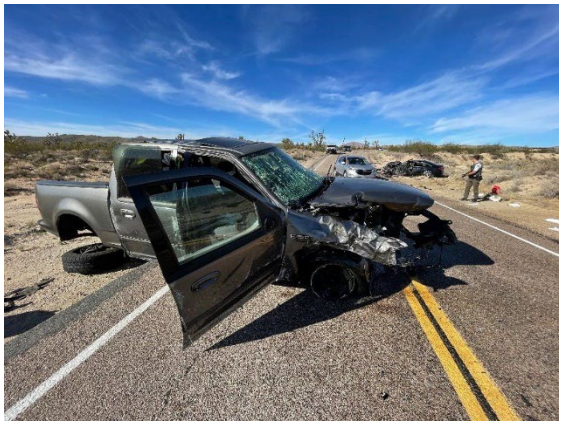

FIGURE 2. EXAMPLE OF A TRAFFIC ACCIDENT IN THE PRESERVE

ISSUES AND RESOURCE TOPICS

An interdisciplinary team of Preserve and regional staff including natural and cultural resource experts and engineers familiar with the project area identified the resource topics considered in this document through a series of internal meetings and site visits, as well as through an analysis of site conditions, federal laws, regulations, executive orders, and NPS director's orders. The NPS identified a range of issues and impact topics to evaluate. Issues are problems that the current situation has caused or that will continue to occur if they are not addressed. Impact topics are resources to be analyzed as part of the proposed project.

The *2015 NPS NEPA Handbook* provides specific guidance for determining whether to retain issues for detailed analysis. Per the handbook (NPS 2015a), issues should be retained for consideration and discussed in detail if:

- the environmental impacts associated with the issue are central to the proposal or of critical importance
- a detailed analysis of environmental impacts related to the issue is necessary to make a reasoned choice between alternatives
- the environmental impacts associated with the issue are a big point of contention among the public or other agencies
- there are potentially significant impacts to resources associated with the issue

If none of the considerations described above apply to an issue, it was dismissed from further consideration. Additional information about issues and impact topics considered but dismissed from consideration are provided in appendix A.

Issues and resource topics that could be affected by this project are provided below and discussed in chapter 3.

- Biological Resources
- Cultural Resources
- Geological Features and Soils
- Visitor Use and Experience
- Water Resources

CHAPTER 2: ALTERNATIVES

INTRODUCTION

This chapter describes the alternatives under consideration for the Kelso-Cima and South Kelbaker Roads rehabilitation project. NEPA requires that federal agencies explore a range of reasonable alternatives, including a "no-action alternative." The description and evaluation of the no-action alternative provides a baseline to which the action alternatives can be compared. Based on these requirements, a no-action alternative (alternative 1) and one action alternative (alternative 2) are described and evaluated here. The action alternative presents a reasonable and feasible approach that meets the purpose of and need for action.

The environmental compliance process for road rehabilitation is typically completed during or after the preliminary design phase to consider environmental effects before expending fiscal resources on subsequent design phases and to incorporate any resource protection measures into the project's overall design. FHWA prepared preliminary design drawings and plans (30%) and plan-in-hand design drawings and plans (70%), and these drawings and plans are described in this section as the most appropriate, cost-effective measures available to improve safety while minimizing impacts on the Preserve's resources (FHWA 2024). The action alternative is based on the best information available to date. Specific distances, areas, and layouts are based on estimates at the maximum limits of the expected impact for resources. If substantial changes are made to the project as a result of relevant information that arises during subsequent design phases, supplemental environmental compliance will be required in accordance with NEPA and any other applicable laws prior to implementing the action.

The chapter also describes other alternatives and alternative elements that were initially considered but dismissed from detailed analysis.

ALTERNATIVE 1: NO ACTION

Alternative 1, the no-action alternative, describes current management practices and the existing conditions of Kelso-Cima Road and South Kelbaker Road. While alternative 1 does not meet the purpose for and need of the project, it provides a basis for comparing management direction and the environmental consequences of alternative 2.

Under alternative 1, the NPS would continue to operate and maintain the existing roadways, as needed. Kelso-Cima Road and South Kelbaker Road would remain in their current conditions and configurations. The existing use and maintenance of the roadways would continue as is, and the current structural and safety issues would remain. The existing travel lanes and shoulder edge drop-offs, which are inadequate for the large passenger vehicles and trailers that use the road, would remain unchanged. The shoulders would continue to deteriorate, resulting in additional shoulder damage and vehicle wheel drop-offs from the pavement edge. At road locations with identified dangerous geometric deficiencies, the potential for accidents would remain, resulting in traffic accidents, injuries, and fatalities. None of the safety issues associated with the sharp curves, abrupt grade changes, poor sight lines and distances, or other concerns would be addressed.

The existing speed limit of 55 mph would remain along the roadway corridor, and drivers would continue to be warned to slow down via road signs. Preserve staff would continue to educate visitors to the dangers of exceeding speed limits by posting information on the Preserve website, at the visitor centers, and in other park publications or meetings. Speed limits would continue to be enforced throughout the Preserve, consistent with current practice.

Accordingly, weather events could increase damage, leading to further roadway and resource degradation. No improvements would be made to Kelso-Cima Road or South Kelbaker Road, including at the

low-water crossings. These roads would continue to be inundated with water during flood events and potentially sustain major road damage. After storm damage, Preserve maintenance staff would complete repairs, consistent with current practice.

This alternative would not address safety concerns, maintenance demands, desert tortoise mortality, or other natural resource impacts. However, the no-action alternative would not increase the amount of impervious surface and would not involve the ground disturbance or vegetation removal associated with construction. Under the no-action alternative, rates of desert tortoise mortality by vehicle strikes would continue until local population vital rates decline to levels that suggest local extirpation. Traffic volume and illegal high speeds on degraded roadways would continue to affect all wildlife in general through vehicle strikes, vegetation and habitat disturbance from vehicles accidentally leaving the roadways, and hazardous material spills.

ALTERNATIVE 2: PROPOSED ACTION

Under alternative 2, the action alternative, the NPS would rehabilitate approximately 42 miles of Kelso-Cima and South Kelbaker Roads to improve safety and visitor access. The roadway improvements would include treatments, such as restriping pavement, adding mumble strips,[2] widening shoulders, paving with asphalt concrete (asphalt), installing low-water crossing features, and adding exclusion fencing for desert tortoises. Alternative 2 also includes the installation of speed limit and other traffic signs, radar speed feedback signs or roadway striping and markings as appropriate, and additional signage to address safety issues and improve visitor experience.

At the discretion of the NPS, a variety of native plants would be salvaged; stored in a temporary nursery, which may be located in the Preserve near Kelso Depot or outside the Preserve; and be replanted to reclaimed areas in the Preserve post-construction. Revegetation work would use soil conserved along the corridor and native species from seed collected along each roadway. Revegetation efforts would attempt to reconstruct the natural spacing, abundance, and diversity of native plant species. The areas newly disturbed during construction would be revegetated using locally collected seed and nursery plants grown from the collected seed.

The following sections describe the actions that would occur under the proposed action.

Roadway Improvements

Alternative 2 would primarily remain on the existing roadway alignment, with adjustments to the vertical and horizontal profile of the roadway, where needed, to improve safety. The horizontal alignment would be adjusted at three select locations along the project corridor on Kelso-Cima Road, between Cima Junction and Cedar Canyon Road, to improve substandard curves and sight distance. The northernmost adjustment would shift the profile up to 16 feet over a distance of 0.13 miles, and the final two locations would involve shifts up to 50 feet over 0.2 miles, and up to 15 feet over 0.3 miles. The vertical roadway profile would be adjusted, up to approximately 7 feet, approaching approximately 11 low-water crossing locations along the project corridor to improve sight distance and safety. The NPS also would realign Cima Junction to provide continuous travel between Kelso-Cima Road and Cima Road. At Cima Junction, Kelso-Cima Road would be realigned to form a gradual horizontal curve to provide safer driving conditions for through-traffic at the posted speed limit. The proposed realignment would reduce the risk of rear-end collisions by eliminating the existing “T” intersection at Cima Road. The existing roadway and pavement on Kelso-Cima Road and Cima Road would be excavated, removed, and

[2] Mumble strips are used when rumble strips cannot be placed due to noise concerns and include an oscillating sine wave pattern to reduce noise outside of the vehicle (FHWA n.d.).

reclaimed, while the existing at-grade crossing of Kelso-Cima Road at the railroad wye would be relocated approximately 150 feet west and improved with pavement markings.

The proposed speed limit would be reduced throughout the project corridor. Lower speed limits, to compensate for busy areas or turnoffs with limited sightlines, would be posted at Kelso Depot and through the Cima Junction area, with the specific limits determined during final design. At Kelso Depot, the proposed improvements would remain within the existing roadway prism to minimize impacts to adjacent resources.

The NPS, in coordination with UPRR, would also decommission and remove the approximately 60-foot guyed wire communications tower located at Cima Junction and install a new self-supporting tower in its place; the new tower would not exceed 65 feet. The proposed tower would be positioned on a subterranean mat foundation that would not be visible from the surface, and a fence would be constructed around the ground equipment for safety measures. The proposed fence would measure approximately 45 feet by 50 feet, and the ground equipment could include a generator and an equipment enclosure. Utilities for the proposed self-supporting tower would be determined during final design. Additionally, an access road would be constructed around the proposed self-supporting tower to provide safe access for construction and maintenance activities at the site. The access road would be graded (both vertically and horizontally) to tie into the proposed roadway profile on Kelso-Cima Road. This work would occur entirely within previously disturbed and surveyed areas.

Rehabilitation of the roadway would primarily consist of partial depth reclamation of existing asphalt; however, several sections of the project area would consist of full-depth reclamation. The proposed improvements would include installation of new asphalt to provide 11-foot-wide travel lanes in each direction, and 2-foot-wide paved shoulders in each direction, for a total pavement width of 26 feet. At Kelso Depot, the replacement roadway would feature 10-foot-wide travel lanes in each direction, paved shoulders of varying widths in each direction, and curb-and-gutter improvements, all within the existing roadway footprint. Additionally, mumble strips would be added along the roadway centerline and roadway shoulders, as needed, to reduce the frequency of roadway departures, while minimizing noise levels in the existing area.

Alternative 2 would include approximately 37 pullouts at designated locations, with approximately 1 pullout location per mile, varying along either side of the project corridor (see Figure 3). Size and configuration of each pullout would include a 14-foot-wide paved lane with pavement markings and asphalt curbing; pullouts would be approximately 14 feet wide and 200 feet long within previously disturbed areas. The exact number of pullouts would be determined during final design. The pullout locations would provide additional opportunities for visitors to enjoy the scenic vistas, take photographs, rest, and make unplanned emergency stops. The proposed pullouts would also aid law enforcement by providing a safe place for drivers to pull over during traffic stops.

The NPS would improve and stabilize existing low-water crossings to enhance cross drainage while allowing drivers to maintain a consistent speed and reducing the potential for roadway damage during heavy rain events. The proposed low-water crossing structures would use concrete barriers, cut-off walls to resist undermining, and riprap protection in the upstream and downstream channel, as needed, to prevent damage during flood events (Figure 4).

FIGURE 3. EXAMPLE OF A SIMILAR PULLOUT AREA RECENTLY COMPLETED ON CIMA ROAD IN THE PRESERVE

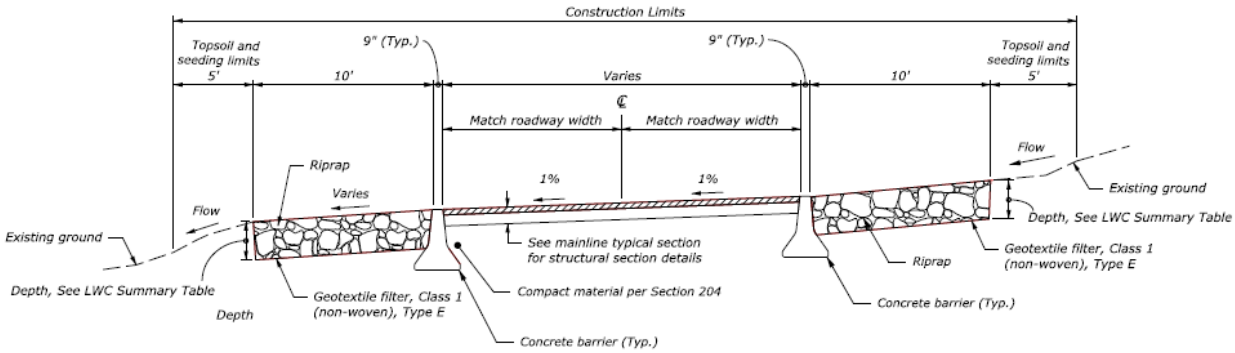

FIGURE 4. TYPICAL LOW-WATER CROSSING CROSS SECTION

Desert tortoise exclusion fencing, following US Fish and Wildlife Service (USFWS) specifications, would be installed along the roadway in the project area to prevent desert tortoises from accessing the roadway and exposure to potential road mortality. The exclusion fencing would incorporate galvanized 1-inch by 2-inch hardwire mesh material and stand approximately 24 inches tall. The exclusion fence would be supported by metal posts and be buried to a depth of at least 12 inches. The tortoise fence would have a U-shaped bend at every fencing terminus to prevent tortoises from entering the roadway. It would have special design features in areas of low-water crossings to allow water and debris to flow past the fence to minimize damage. Some portions of the project area, including the western side of Kelso-Cima Road, would use recessed vertical concrete barriers on the downstream side of low-water crossings that prevent desert tortoises from accessing the roadway, while allowing other wildlife to escape. The vertical barriers would typically range from approximately 12 to 22 inches in height; approximately 40 to 50 vertical barriers would be constructed along the project corridor.

As part of this alternative, and where U-shaped fencing termini would not be feasible, the NPS could also install several tortoise crossings structures along the length of the project corridor, where existing low-water crossings are located. The tortoise crossing structures would feature approximately 2-foot

diameter concrete structures under the roadways. The tortoise exclusion fences would tie to the crossing structures under the road to help guide safe passage for the desert tortoise. Exclusionary fencing, combined with crossing structures, have been shown to significantly reduce desert tortoise mortality along roadways (Boarman and Sazaki 1996; Boarman et al. 1997; Boarman and Kristan 2006; Dutcher et al. 2023). One study compared fenced and unfenced sections of a highway and found that fencing alone reduced the number of tortoise mortalities on roads by 93% (Boarman and Sazaki 1996). Additionally, concrete crossing structures, like those proposed under alternative 2, rather than corrugated metal culverts, are preferred because they hold the appropriate substrate conducive to tortoise passage (USFWS 2014). Other design considerations that contribute to the success of desert tortoise crossings include crossing structure placement (preferably in washes), the openness ratio of the crossing structure (the structure's cross section/length), fencing type and mesh size, and spacing of road crossings (Boarman and Kristan 2006). USFWS (2014) has also considered these factors in issuing recommendations for desert tortoise crossings in Mojave Desert.

Visitor Use Improvements

Alternative 2 would include several improvements along the project corridor related to visitor use and experience, including at Kelso Dunes and Granite Pass, and near the entrance to the Preserve on South Kelbaker Road. The NPS would provide a pullout area near the viewpoint at Kelso Dunes to allow visitors to enjoy the scenic vistas, take photographs, rest, and make unplanned emergency stops near Kelso Dunes. The proposed pullout area would be similar to the other proposed pullouts along the project corridor, but the paved area would be approximately 16 feet wider to accommodate parallel parking and a 6-foot-wide sidewalk with asphalt curbing. It would also incorporate a concrete pad "bump-out" (approximately 10 feet by 7 feet) for future interpretive signage. The area behind the pullout (approximately 4 feet) would need to be graded to tie into the existing ground surface. This work would occur within a previously surveyed area and areas disturbed by roadway construction and maintenance.

At Granite Pass, the NPS would improve the existing parking area, including repaving the parking area and installing pavement markings, installing a concrete pad for future restroom facilities, providing accessibility features, and adding new signs. In addition, the existing viewpoint at Granite Pass would be expanded to improve safety of ingress and egress for visitors. This work would occur entirely within previously disturbed areas.

The NPS would also relocate the existing entrance sign for the Preserve to the area near I-40 toward the end of the project area (**Error! Reference source not found.**). The entrance sign would be located near a proposed welcome area for visitors that would include a parking area near the Preserve entrance, new pavement and pavement markings, a concrete sidewalk along the perimeter edge, and additional informational signage for visitor use.

FIGURE 5. EXISTING ENTRANCE SIGN TO BE RELOCATED

Additional signage proposed in the project area would improve traffic safety and hazard communication to travelers (e.g., speed feedback, soft shoulder, winding road, curve ahead, wildlife awareness, "Do Not Enter When Flooded," and "Flash Flood Area"). The NPS would limit the amount of signage proposed throughout the project area, to the extent feasible, to minimize impacts to the landscape. The amount and location of the proposed signage would be determined during final design.

Construction Materials and Disposal

To the extent possible, material delivery and disposal hauling would occur on the main arterial roadways in the region. Contractor hauling operations would comply with legal load limits, and any unsuitable and

excess construction materials would be disposed of outside the Preserve in accordance with NPS and FHWA specifications. The proposed action is expected to generate waste material. To the extent possible, existing on-site demolished materials, such as waste concrete and pulverized asphalt, may be recycled and reused to reduce waste and truck traffic. During final design, the NPS and FHWA would establish parameters for material disposal for the construction contractor.

Staging Areas

All staging areas would be on previously disturbed areas, existing roadbeds, or disturbed pullouts. No staging would occur on previously undisturbed land. One potential staging area could be a location immediately southwest of the project limits on South Kelbaker Road near the southern entrance of the Preserve. The second potential staging area could be located in an area near the intersection of Kelso-Cima Road and South Kelbaker Road, near the Kelso Depot visitor center. If used, these sites would be temporarily closed during construction. During construction, the volume of construction vehicle traffic to, from, and through the project and staging areas would be higher because of the removal of old road materials and the arrival of new materials. After construction, the NPS would restore staging areas to their previous condition, where feasible, and there would be no change in size or location of the existing area.

Construction Duration and Roadway Detours

The NPS anticipates construction of alternative 2 would take up to three years to complete, weather permitting. The contractor would determine the project schedule and would incorporate biological resource protection and other restrictions outlined in appendix B. Preserve roads provide access for medical, fire and emergency services for residents who live in the Preserve and visitors to the Preserve. Where feasible, the NPS would provide access to the project area; however, roadway closures would help reduce overall construction costs and project duration. The length of detours may vary depending on which roadway segments are closed during construction.

RESOURCE PROTECTION MEASURES

To minimize resource impacts related to the proposed action, the project would implement mitigation measures and best management practices whenever feasible. These resource protection measures are presented in appendix B. These protection measures are considered part of the preferred alternative and would be implemented to avoid or reduce impacts on Preserve resources and values. The measures in appendix B are subject to the final design and approval of plans by relevant agencies.

ALTERNATIVES CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

During the initial design process, the NPS and FHWA evaluated potential roadway safety improvements within the project area that were not carried forward for further analysis for the following reasons:

- technical or economic infeasibility
- inability to resolve the purpose and need for taking action
- duplication with other, less environmentally harmful, or less expensive alternatives

The alternatives that were considered but dismissed are summarized in appendix C.

CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter describes the existing condition of the resources retained for analysis, along with reasonably foreseeable environmental trends and planned actions for those resources. The descriptions of the resources provided in this chapter serve as an account of the baseline conditions within the project area. The resources described in this chapter are biological resources—vegetation, terrestrial wildlife, and threatened and endangered species; geological features and soils; cultural resources—historic structures, historic districts (HDs), cultural landscapes, and archeological and ethnographic resources; visitor use and experience; and water resources—floodplains, surface water, and groundwater.

Chapter 3 also describes the potential impacts on these resources from implementing the no-action alternative and the proposed action alternative. Resource protection measures are part of the proposed action and are discussed in more detail in appendix B. Where appropriate, resource protection measures have been incorporated into the evaluation to prevent or lessen adverse impacts. Any modifications to the design would reduce or avoid impacts on Preserve resources.

ANALYSIS METHODS FOR ESTABLISHING IMPACTS

The analysis of impacts follows Director's Order 12 procedures (NPS 2011a), the NPS *NEPA Handbook* (NPS 2015a), and the NPS *NEPA Handbook Supplemental Guidance: Preparing Focused and Concise Environmental Assessments* (NPS 2015b). The intensity of impacts is assessed in the context of the Preserve's purpose and significance and any resource-specific context that may be applicable. The methods used to assess impacts vary depending on the resource being considered but generally are based on a review of pertinent literature and studies, information provided by on-site experts and other agencies, professional judgment, and Preserve staff knowledge and insight.

Area of Analysis for Impacts

Area of analysis refers to the geographic setting within which an impact may occur, such as the affected area within the project area. For the purposes of this project, most impacts are local to the immediate project area unless otherwise noted.

The area of analysis is based on conceptual design information and reasonable assumptions. Therefore, the approximate disturbance calculations are subject to change during subsequent design phases. Changes that are not addressed by the range of impacts covered in this document may require additional NEPA compliance.

Type of Impact

The potential impacts of the alternatives are described using the following terminology:

- **Short term**: Impacts that would occur as a result of the construction activities. Depending on impact topic, impacts may be intermittent (days or weeks) or continuous during construction.
- **Long term**: Impacts that would continue to occur after construction is complete and may continue for years or decades.
- **Beneficial**: A favorable change in the condition or appearance of the resource, or a change that moves the resource toward a desired condition.
- **Adverse**: A change that declines, degrades, and/or moves the resource away from a desired condition or detracts from its appearance or condition.

Past, Ongoing, and Reasonably Foreseeable Actions

To determine potential impacts, past, ongoing, and reasonably foreseeable actions and land uses are identified along or near the Kelso-Cima and South Kelbaker Roads. These actions are then assessed in conjunction with the impacts of the alternatives to determine whether they would have added adverse or beneficial effects on a particular resource within the Preserve. The evaluation of reasonably foreseeable impacts is based on available information.

The actions detailed in Table 1, and shown in Figure 6, are considered in the reasonably foreseeable impacts analysis for each resource analyzed in detail.

TABLE 1. ACTIONS CONSIDERED FOR REASONABLY FORESEEABLE IMPACTS ANALYSIS

Project	Project Description	Status	Resources Affected
Reconstruct Road Segments to Improve Safety	The NPS made safety improvements on paved and unpaved roads in the Preserve, in San Bernardino County, California. The changes to eight roadway locations were designed to reduce the number of vehicle collisions in the Preserve by improving roadway elevations, grades, curvature, and sight distances, and by realigning two intersections. The project also included improvements to maintain safe ingress/egress at three sites on unpaved roads that serve as main access roads for the local community. Roadway embankment protection, totaling about 1.6 miles, was installed where flood events have frequently caused damage, and two low-water crossings that total 320 feet were reinforced to reduce the severity and incidence of washouts.	Environmental Assessment completed November 2014, Finding of No Significant Impact signed June 2015 (Past Action)	Biological, Geologic Features and Soils, Cultural, Visitor Use and Experience, Water
Cima Road Rehabilitation	The NPS rehabilitated approximately 18 miles of roadway on Cima Road from Kelso-Cima Road to I-15. The route is characterized by extremely soft shoulders and numerous low-water crossings. The project increased the roadway width to a consistent 26 feet; providing low-water crossings; and improving safety, updated signing, pavement markings, and paved pullouts. Additionally, the project provided spot location improvements to Kelbaker Road, including low-water crossings and pavement rehabilitation.	Categorical Exclusion completed December 2014 (Past Action)	Biological, Geologic Features and Soils, Cultural, Visitor Use and Experience
Road Safety Improvements at the Preserve	The NPS implemented the Mojave National Preserve Road Safety Plan by installing 330 sign systems, 334 miles of payment markings, 147 miles of rumble/mumble strips, and 600 square feet of shoulder reconditioning and vegetation management to correct road sight lines. The roads being improved by this project include North and South Kelbaker, Kelso-Cima, Morningstar, and Ivanpah Road.	Categorical Exclusion completed January 2023 (Past Action)	Biological, Geologic Features and Soils, Cultural, Visitor Use and Experience

Project	Project Description	Status	Resources Affected
Pavement Pulverization on Morning Star Mine Road	The NPS proposes to remove the pavement on Morning Star Mine Road in the Preserve, in San Bernardino County, California. The project would pulverize and remove approximately 15 miles of pavement on Morning Star Mine Road to provide resource protection for desert tortoises.	Categorical Exclusion completed March 2024 (Reasonably Foreseeable Future Action)	Biological, Geologic Features and Soils, Cultural, Visitor Use and Experience
Routine Maintenance and Emergency Repairs in the Preserve	The NPS has and will continue to conduct routine and emergency maintenance, repairs, and safety improvements throughout the Preserve. Activities include: • Emergency Response Permanent Repairs on North Kelbaker, Essex, and Black Canyon Roads (completed 2023): This project made permanent repairs to roads affected during the summer 2022 monsoon floods under the Emergency Relief Funding for Federally Owned Roads. The most critical repairs included two major washouts on North Kelbaker Road that required increased armoring and construction of water-diversion elements. • Emergency Repairs of Roads Parkwide from Flood Damage (completed 2022): This project repaired roads at the Preserve damaged by flooding caused by monsoonal rains during July 2022, which left all of the Preserve's main paved roads damaged and some impassable to normal traffic. Repairs primarily consisted of removal of flood debris from the roadway onto the immediate road shoulders. Areas of washouts and road erosion were repaired by adding park-approved aggregate as a temporary repair. Road clearing was conducted by a commercial street sweeper.	Completed 2022 and 2023, Ongoing, and as Needed (Past Action and Reasonably Foreseeable Future Action)	Biological, Geologic Features and Soils, Cultural, Visitor Use and Experience, Water

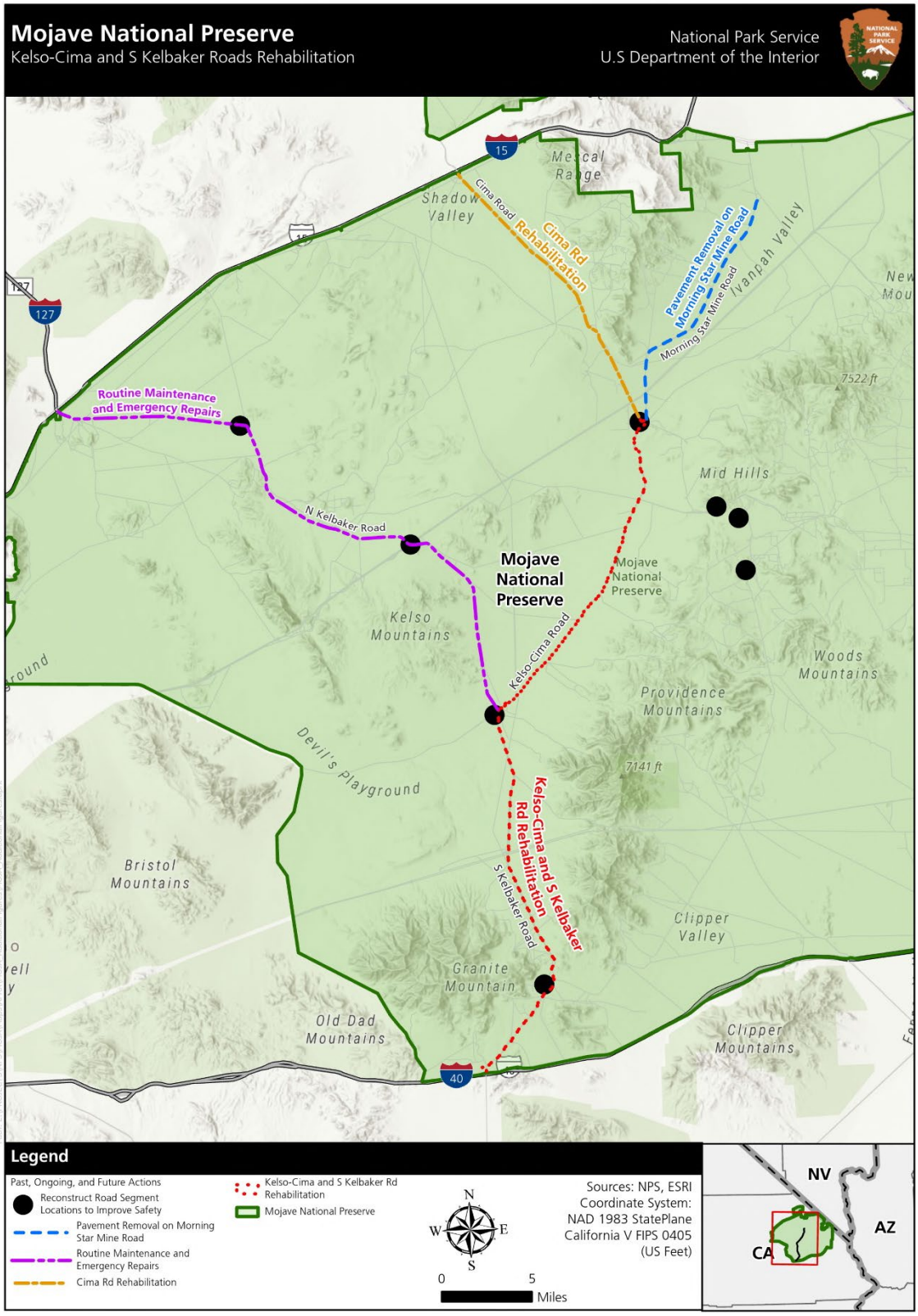

FIGURE 6. PAST, ONGOING, AND REASONABLY FORESEEABLE ACTIONS AT THE PRESERVE

BIOLOGICAL RESOURCES

Affected Environment

Vegetation

The Mojave Desert is the smallest and driest of the four North American deserts, covering approximately 50,000 square miles and supporting an estimated 2,500 plant taxa of which more than 200 are endemic to California (Keeler-Wolf 2007). The region is topographically diverse, composed of a series of mountains and valleys as part of the Basin and Range Geomorphic Province. The Preserve contains three major North American Deserts: Great Basin, Mojave, and Sonoran. The vegetative communities within the Preserve are mainly derived from the Mojave Desert but also include species of the Great Basin and Sonoran Deserts, and even some attributes of the California Coastal Zone (Digital Desert 2024). Vegetation community types are diverse within the Preserve, with five distinct vegetation communities bisecting the project area: creosote scrub covered flats and alluvial fans, Joshua Tree Woodland, Mojave Yucca Scrub, Creosote-Burrobush Desert Scrub, Creosote-Burrobush/Big Galleta Dune Desert Scrub, and numerous desert washes. The project area also supports sensitive biological soil crusts.

The project area encompasses approximately 42 miles of roadway, covering limited vegetated areas. On the north end of the project area, at the intersection of Cima and Kelso-Cima Roads, vegetation adjacent to the roadway consists of perennial herbs and shrubs native to California, including Mojave woodyaster (*Xylorhiza tortifolia*) and branched pencil cholla (*Cylindropunita ramosissima*). Joshua trees (*Yucca jaegeriana*) predominate along Cima Road. Russian thistle (*Salsola kali*), an annual herb not native to California, is the predominant vegetation adjacent to the roadway on the north end of the project area. Along Kelbaker Road, the predominant species consist of annual and perennial herbs, including the nonnative Saharan mustard (*Brassica tournefortii*), and the native Spanish needle (*Palafoxia arida*), Sonoran sandmat (*Euphorbia micromera*), six weeks grama (*Bouteloua barbata*), and sandpaper plant (*Petalonyx thurberi*) (Calflora 2024). Below 3,800 feet elevation, the vegetation transitions to creosote bush (*Larrea tridentata*) and burrobush (*Ambrosia dumosa*).

Terrestrial Wildlife

The Preserve's diverse habitats, from Joshua tree woodlands to sand dunes, provide shelter for an array of desert-adapted species. The Preserve is home to 50 known species of mammals, more than 200 species of birds, 36 species of reptiles, 3 species of amphibians, 3 species of fish, and numerous species of insects and arachnids (NPS 2024a). Species include the gila monster (*Heloderma suspectum*), desert tortoise (*Gopherus agassizii*), Mojave fringe-toed lizard (*Uma scoparia*), regal ring-necked snake (*Diadophis punctatus*), desert striped whipsnake (*Coluber taeniatus*), and Mojave green rattlesnake (*Crotalus scutulatus*). The desert tortoise, also present in the Preserve, is discussed in more detail under "Threatened and Endangered Species." Avian fauna includes peregrine falcon (*Falco peregrinus*) and prairie falcon (*Falco mexicanus*), thrashers (*Toxostoma* spp.), burrowing owl (*Athene cunicularia*), golden eagle (*Aquila chrysaetos*), roadrunners (*Geococcyx californianus*), and Gambel's quail (*Callipepla gambelii*) (NPS 2002a). Other common birds include various hawks, turkey vultures, owls, hummingbirds, woodpeckers, flycatchers, ravens, wrens, and sparrows (NPS 2014).

The Preserve is also home to 10 to 15 bat species, depending on the season, including the canyon bat (*Parastrellus hesperus*), California Myotis (*Myotis californicus*), and Mexican free-tailed bat (*Tadarida brasiliensis*)." However, the project area, contains minimal vegetation cover and biome diversity, providing nominal habitat coverage for species. Terrestrial wildlife likely to be present in the project area include smaller species that are accustomed to the areas extreme summer temperatures and lack of water. These smaller species could include mice, rats, squirrels, chipmunks, birds, and gophers. Also common in arid climates are reptiles, including a variety of different lizard and snake species.

Lizards, which are diurnal, or active during the day, are the most widely observed reptile in the Preserve. Lizards are likely to frequent the project area because they prefer arid plains that contain creosote bush and other scattered low plants, as well as sand and gravel, which they use for basking. Lizard species potentially occurring in the project area include the western whiptail (*Aspidoscelis tigris*), chuckwalla (*Sauromalus obesus*), long-nosed leopard lizard (*Gambelia wislizenii*), western fence lizard (*Sceloporus uniformis*), long-tailed brush lizard (*Urosaurus graciosus*), and the common side-blotched lizard (*Uta stansburiana*). The project area also likely provides refuge for a number of snake species, including the Mojave rattlesnake (*Crotalus scutulatus*), California kingsnake (*Lampropeltis californiae*), gopher snake (*Pituophis catenifer*), and glossy snake (*Arizona elegans*) (NPS 2024a).

The Migratory Bird Treaty Act (16 United States Code [USC] 703–712) protects most native birds and their nests, eggs, young, and parts from possession, sale, purchase, barter, transport, import, and export, and take. It applies to birds that are identified in 50 Code of Federal Regulations (CFR) §10.13 and would include nearly all species found in the Preserve. Many migratory birds, including raptor species, are sensitive to disturbance when nesting and roosting. As identified by the USFWS Information for Planning and Consultation (IPaC) screening tool (USFWS 2025), the following birds of conservation concern occur in the project area and have potential to be affected by project activities: Bendire's thrasher (*Toxostoma bendirei*), black-chinned sparrow (*Spizella atrogularis*), costa's hummingbird (*Calypte costae*), long-eared owl (*Asio otus*), and pinyon jay (*Gymnorhinus cyanocephalus*).

Threatened and Endangered Species

Under the Endangered Species Act of 1973 (ESA), as amended, an endangered species is defined as any species in danger of extinction throughout all or a significant portion of its range. Federally listed species that may occur in the project area were identified through the USFWS IPaC system and confirmed in an official species list issued by the Carlsbad Fish and Wildlife Office in San Bernadino, California (USFWS 2025). The project area contains confirmed populations, and/or potentially viable habitat, for one federally endangered, one federally threatened, one candidate species, one state (California) endangered species, and one state threatened species. Federally listed species are the desert tortoise and the southwestern willow flycatcher (*Empidonax traillii extimus*). However, the southwestern willow flycatcher is excluded from further analysis because suitable habitat is not present; therefore, the species is not expected to occur in, or near, the project area. The monarch butterfly is a candidate for federal listing.

The California Endangered Species Act (CESA) is a California environmental law that conserves and protects plant and animal species at risk of extinction. Originally enacted in 1970, plant and animal species may be designated threatened or endangered under CESA after a formal listing process by the California Fish and Game Commission (California Department of Fish and Wildlife 2024). Federally listed species that may occur in California are included in California's threatened or endangered species list but are not assigned a separate state-level protection status. State-listed species with the potential to occur in the project area include the gilded flicker (*Colaptes chrysoides*).

The project area provides suitable habitat for federally and state-listed species, including the desert tortoise, monarch butterfly, and gilded flicker. Habitats adjacent to the roadway consist of Joshua tree associations that mix with cacti and Mojave–Sonoran Bajada and Valley Desert Scrub plant assemblages. The project area lies within an arid climate that lacks water or cover from canyons or mountains. Species habitat preferences and occurrence in the project area are discussed in the sections that follow.

Federally Listed Species – Desert Tortoise

The desert tortoise is known to occur within the areas that would be affected by this project; the entire Mojave population was listed as a threatened species in 1990 (USFWS 1994a). The habitat range of the desert tortoise includes the Mojave and Sonoran Deserts in Southern California, Arizona, southern Nevada, the southwestern tip of Utah, and Sonora and northern Sinaloa, Mexico. The project area

provides favorable conditions for the desert tortoise; the area is characterized by scattered shrubs, especially creosote bush, with intershrub space for the growth of herbaceous plants. Additionally, it offers saltbush scrub, desert wash, desert scrub, and Joshua tree woodlands. Common soils within the project area have medium textures composed of calcium carbonate accumulations, desert pavement, and rocky, boulder terrain, making the area viable habitat for desert tortoise to burrow. Soils within the project area are also discussed in more detail under "Geologic Features and Soils." Desert tortoises spend a large portion of the year underground in burrows to avoid extreme temperatures and, for younger tortoises, to avoid predators such as coyotes, foxes, raptors, and ravens (Boarman 2002). Desert tortoises generally are active during spring, early summer, and autumn when annual plants are most common and daily temperatures are tolerable. Additional activity occasionally occurs during warm weather in winter months and after summer rainstorms (Boarman 2002). Surveys conducted by the NPS, in fall 2023 through spring 2024, recorded low desert tortoise occupancy along the Kelso-Cima corridor, with only two potential tortoise burrows with recent activity observed, despite excellent to good habitat available adjacent to the roadway.

The USFWS designated critical habitat for the Mojave population of the desert tortoise in 1994 (USFWS 1994a). The Preserve has approximately 144 miles of paved and 3 miles of maintained dirt roads that traverse designated desert tortoise critical habitat (NPS 2014). Approximately 147 miles of unmaintained roads in critical habitat were closed to motorized vehicles by the congressional designation of wilderness as a result of the 1994 California Desert Protection Act. The most heavily used roads are Kelbaker, from I-40 to Kelso (about half of which traverses critical habitat for desert tortoise), Kelso-Cima Road (100% of which is located within critical habitat), and Morningstar Mine Road, from Cima to the Nipton Road (100% of which is located within critical habitat). Figure 7 shows the project area in relation to desert tortoise critical habitat. Though desert tortoises spend much of their time in burrows, when they do emerge for food, water, or mates, they will commonly cross these heavily used roadways that intersect their territory. As a result, the desert tortoise is particularly vulnerable to oncoming vehicles, making road mortality a pervasive issue in the project area.

In June 1994, the USFWS released the *Desert Tortoise (Mojave Population) Recovery Plan*, which presents recommendations for population recovery (USFWS 1994b). This document also includes maps of critical habitat and areas where recovery actions are recommended; these areas are called Desert Wildlife Management Areas. A revised recovery plan was released in 2011 (USFWS 2011). More recent surveys suggest that desert tortoise densities have declined since issuance of the 2011 revised recovery plan (USFWS 2022). Surveys from 2021 indicate there are fewer than 2.0 tortoises per square kilometer in the Ivanpah Critical Habitat Unit, which is the critical habitat unit that this project traverses. In August 2019, the USFWS provided a Programmatic Biological Opinion to the NPS regarding the effects of Preserve activities and operations on the federally listed desert tortoise, stating that the activities covered by consultation may affect desert tortoises and their critical habitat.

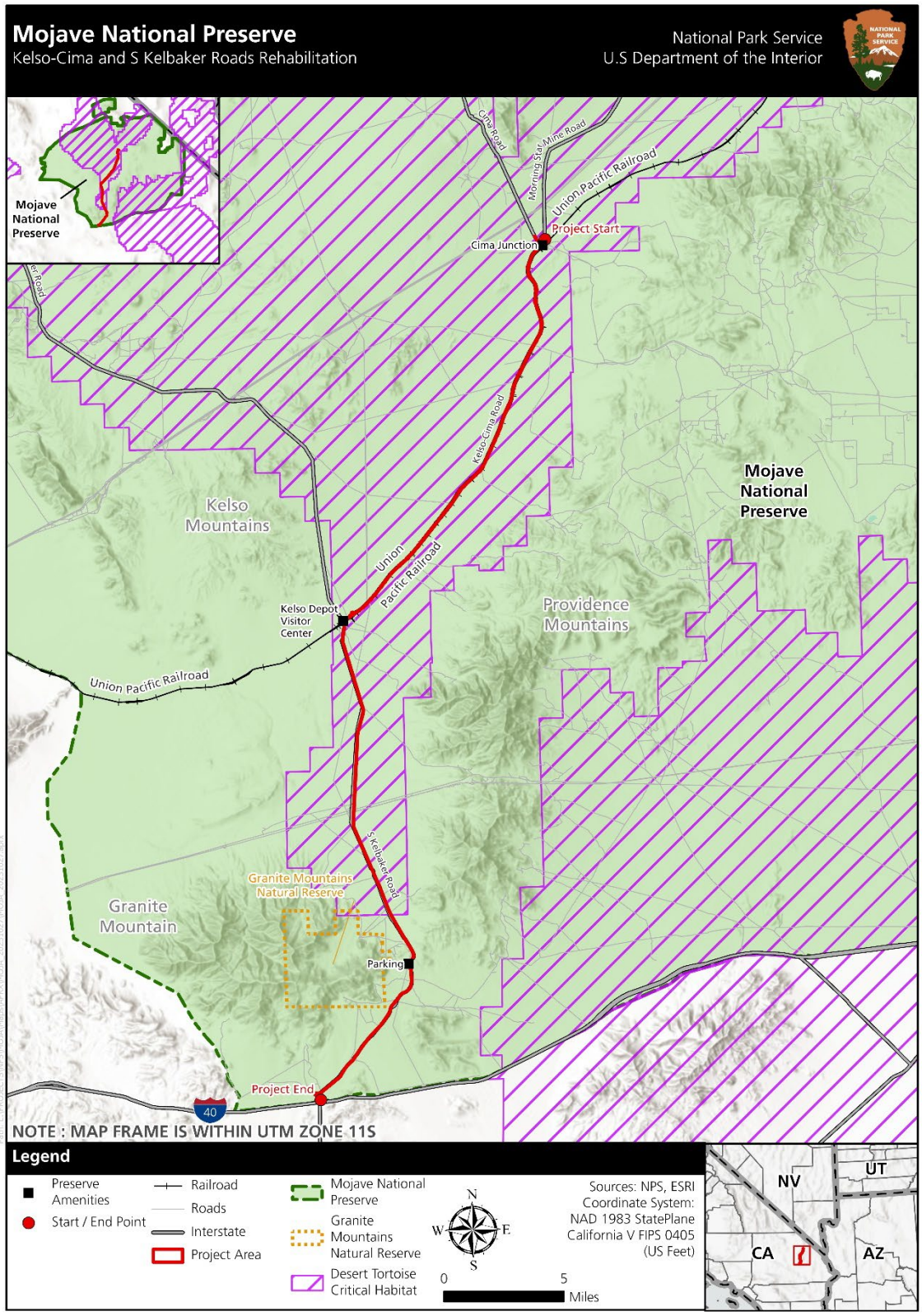

FIGURE 7. PROJECT LOCATION IN RELATION TO DESERT TORTOISE CRITICAL HABITAT

Federally Listed Species – Monarch Butterfly

Monarch butterflies have been documented breeding, brood rearing, and foraging in the Preserve, though they are considered uncommon. Desert milkweed (*Asclepias erosa*), a primary plant required for brood rearing, occurs along most Preserve roads. Monarch butterflies occur throughout the contiguous United States in two distinct populations, east and west of the Rocky Mountains. In western North America, monarch butterflies travel as far north as southern Canada in the spring from their wintering grounds along the California coast into northern Baja California over two to three successive generations, breeding along the way before returning to their wintering sites. Beginning in October, populations of monarchs that live west of the Rocky Mountains start arriving in California to breed and wait out the winter, before heading inland in the early spring. This migration can take over two months and cover distances of approximately 2,000 miles (USFWS 2020). Adult monarchs feed on milkweed as well as the nectar from flowers, which contain sugars and other nutrients. Unlike larvae that only eat milkweeds, adult monarchs feed on a wide variety of nectar bearing flowers (USDA 2024).

State-Listed Species – Gilded Flicker

The gilded flicker is a member of the woodpecker family that inhabits the arid and hotter regions of California. Their preferred habitat lies within the Sonoran Deserts, where they are strongly associated with dense concentrations of saguaro and Mexican giant cardon cacti. The diet of gilded flickers consists of insects, especially ants, which they forage from the desert floor. Beetles, termites, caterpillars, and larvae are also common. Gilded flickers also eat cactus fruits, flowers, and seeds, particularly in the winter (Earth Life 2023). The project area is limited in vegetated cover and does not have dense concentrations of large cacti; however, it does provide suitable foraging habitat, making it likely that the gilded flicker occurs within the project area. In the Preserve, gilded flickers concentrate in Joshua tree woodlands.

Trends and Planned Actions

Increased exposure to warming from unprecedented weather events is expected to threaten biodiversity and wildlife in the project area. Many different factors such as exposure, sensitivity, and adaptive capacity are fundamental components of weather vulnerability. The Mojave Desert has warmed 3.6 degrees Fahrenheit (°F), and precipitation has declined by 20% in some areas over the past century (Waters 2021). The increases in temperature are likely to cause stress for desert animals, affecting their metabolic energy intake and expending energy outside their temperature comfort zones (NPS 2009). Plants may also be susceptible to unprecedented weather events, which may in turn affect species relying on vegetation for habitat. Although drought conditions are already common within the project area, drought periods are expected to become more frequent, intense, and longer (USEPA 2024).

Unprecedented weather events are expected to impact taxa at varying degrees. A study conducted in 2021 analyzed how exposure to unprecedented weather events, including higher temperatures, drives stability or collapse of desert animals, specifically mammal and bird communities. Little change was found in mammal richness or occupancy, but large declines were found across bird communities. This decline was attributed to microclimate differences; specifically, mammals can mitigate temperature impacts through burrowing, whereas birds are generally more exposed (Riddell et al. 2021). Increasing temperatures are also expected to affect reptiles, specifically the desert tortoise. Desert tortoise population declines can be partially attributed to direct and indirect human-caused mortality coupled with the inadequacy of existing regulatory mechanisms to protect the species and fluctuations in weather and temperature patterns (USFWS 2011). A long-term study analyzed desert tortoises over time starting in 1978. From 1978 until 1996, the desert tortoise's population remained high and stable, but from 1997 onward, the species suffered from drought. According to computer models, mortality coincided with lack of rain in the winter. If drought duration and frequency increase, desert tortoise populations are likely to experience wider and more significant impacts (Lovich et al. 2014). The NPS intermittently conducts research and monitoring activities of wildlife in the project area; these activities are expected to continue in the future.

Measures to reduce impacts from unprecedented weather events would include restoring, enhancing, and maintaining habitat connectivity so animals can move freely in response to local climatic conditions. Reducing and preventing habitat fragmentation would provide adequate space and habitat heterogeneity, while minimizing disturbances that destroy natural habitats and promote invasion of exotic weeds that would help maintain healthy diverse landscapes.

In addition to changes from unprecedented weather events, road mortality, other ongoing threats, and past and ongoing actions could affect biological resources. Tortoise-vehicle collisions are a major source of desert tortoise mortality and have likely contributed to a decline in desert tortoise population densities, including in the Ivanpah Critical Habitat Unit, which the project area crosses (USFWS 2022). Past and ongoing actions at the Preserve include the reconstruction of road segments to improve safety and rehabilitation of Cima Road. These actions resulted in short- and long-term, adverse impacts as well as short- and long-term, beneficial impacts. All wildlife experienced adverse impacts as a result of increased noise and disturbances. Desert tortoise experienced short-term, adverse impacts through the loss of foraging and burrowing habitats. Additionally, vegetation was lost from direct contact, compaction, removal, and excavation as a result of the past actions. Beneficial impacts related to the reconstruction of road segments included installation of wildlife crossing signage, and improved sight lines and sight distances that reduced the likelihood of accidental collisions with desert tortoises and other wildlife crossing the roadway.

Future actions at the Preserve include pavement removal on Morning Star Mine Road and routine maintenance and emergency repairs in the Preserve. These actions could result in adverse impacts to wildlife, including threatened and endangered species and vegetation during clearing, grading, and trenching activities as well as disturbance by noise or vibrations from heavy equipment. Future actions such as the pavement removal on Morning Star Mine Road would involve pulverizing and removing approximately 15 miles of pavement that would disturb wildlife and the desert tortoise; however, the project would reduce road mortality for desert tortoises, resulting in beneficial impacts. Additionally, future actions would include improving public safety and the resilience of the roads, which would specifically reduce desert tortoise mortality.

Environmental Consequences

Alternative 1: No-Action Alternative

Under the no-action alternative, the existing roadways would remain in their current condition and would not be improved. Therefore, adverse impacts associated with the removal of vegetation during road construction would not occur. Additionally, construction that could have resulted in the introduction of invasive and/or nonnative plant species, as well as disturbances that could damage or destroy small areas of vegetation communities would not occur. The vegetation community within and adjacent to the project area would remain intact and would not be affected as a result of the no-action alternative.

Vehicles traveling along the roadways could continue to impact terrestrial wildlife, including federally and state-protected species such as the desert tortoise. Visitors traveling at a high rate of speed on degraded roadways could affect wildlife and the threatened desert tortoise through vehicle strikes and habitat disturbance when vehicles accidentally leave the roadway. Although the habitat within the project area was initially disturbed during the original roadway construction, which led to fragmentation and created the mechanism for tortoise-vehicle collisions, the ongoing deterioration of the roadway would exacerbate this issue. As the road deteriorates, it increases the likelihood of vehicle collisions from damaged shoulders and unstable surfaces potentially pushing vehicles off the roadway, further disturbing wildlife and contributing to higher rates of tortoise-vehicle collisions. Damage to the roadway would be exacerbated by continued weather events and flooding that would result in further erosion and weaken road surfaces. Without the proposed improvements to the roadway and the installation of wildlife exclusion fencing and crossing structures, wildlife, including the desert tortoise, would continue to face mortality from vehicle strikes and ongoing habitat fragmentation. Therefore, the no-action alternative is

anticipated to have long-term, adverse impacts on terrestrial wildlife and result in ongoing adverse impacts that threaten the desert tortoise.

Alternative 2: Proposed Action

Vegetation

Construction activities under alternative 2, including improvements to the existing Granite Pass parking area and Kelso Dunes viewpoint, a new paved welcome area, and road realignment, would damage or destroy small areas of vegetation (i.e., Joshua trees; Mojave yucca; banana yucca; cacti including cholla, beavertail, and hedgehog; and native shrub and grass species) adjacent to the roadway. Approximately 70 acres of vegetation would be cleared to accommodate the proposed roadway improvements. Removing or damaging desert vegetation would have short-term, adverse impacts on vegetation. Although vegetation may experience short-term, adverse impacts during the process of relocation or revegetation, this process is meant to ultimately mitigate impacts and allow for areas disturbed during construction to be revegetated through seeding; replanting with native, nursery-grown plants; and replanting of plants salvaged prior to construction. Approximately half of the cleared area (35 acres) would be restored using salvaged soils that would be windrowed on-site and then returned to their previous location to preserve the native seed bank. The remaining approximately 35 acres would not be suitable for revegetation because it would be included in the roadway shoulder. An additional 4.7 acres (approximately) would be revegetated around the new pullouts. Additional mitigation measures would include collecting seeds and salvaging cacti, Joshua trees, Mojave yucca, and banana yucca plants prior to road construction work. These plants have a high rate of transplant survival and may be removed and transplanted to a temporary holding nursery located in the Preserve near Kelso Depot or outside the Preserve. Approximately 635 plants would be salvaged from the cleared areas, including approximately 89 Joshua trees. Revegetation work would use soil conserved along the corridor and native species from genetic stock originating in the Preserve. Revegetation efforts also would attempt to reconstruct the natural spacing, abundance, and diversity of native plant species. The areas newly disturbed during construction would be revegetated using locally collected plant species (seeds, nursery plants grown from native seed, and salvaged plants). The NPS is preparing a revegetation plan that would guide restoration efforts if the proposed action were implemented.

Additional adverse impacts that would result from the proposed project activities include soil compaction and the potential spread of invasive and/or nonnative species from the use of construction equipment. Vegetation removal and soil disturbance could facilitate the spread of invasive and/or nonnative plant species, ultimately degrading native vegetation communities. Furthermore, soil compaction disrupts the physical environment that plants rely on for growth by restricting root development and nutrient uptake and increasing erosion (University of Minnesota 2018). Compacted soils often become devoid of vegetation because they lose the ability to hold and conduct water, nutrients, and air necessary for plant root growth (USDA 2019). As mitigation for these impacts, the contractor would be required to clean all equipment prior to entering the Preserve to begin work to avoid the spread of invasive species onto the site from outside areas. Restoring cleared areas (approximately 35 acres) using salvaged soils, as described above, would also reduce soil compaction and the potential spread of invasive and/or nonnative species. These mitigation measures would partly offset adverse impacts and provide long-term, beneficial impacts by helping restore ecosystem function.

Terrestrial Wildlife

Under alternative 2, the NPS would rehabilitate and improve safety on Kelso-Cima and South Kelbaker Roads by widening shoulders and paving with asphalt. Wildlife would experience impacts such as disturbance, displacement, and behavior modification from the increased likelihood of human encounters during the construction period, as well as from the habitat modification that would result from the proposed project. The addition of recessed vertical concrete barriers along western portions of Kelso-Cima Road would also result in adverse impacts to existing habitat due to excavation, but would

provide long-term, beneficial impacts by allowing wildlife to cross the roadway without obstruction from the tortoise exclusion fencing. A study by Boarman and Sazaki (1996) found that wildlife species, other than desert tortoises, also benefit from the use of these barrier fences and crossing structures. Other species that were documented using desert tortoise crossing structures included small- to medium-sized vertebrates (e.g., coyote, kit fox, jackrabbit, ground squirrels, kangaroo rats, snakes, and lizards) (Boarman and Sazaki 1996). Therefore, these wildlife species may also benefit from the proposed crossing structures.

As a result of the removal of old road materials and the arrival of new project materials, construction traffic would increase significantly in the project area, which could pose a threat to terrestrial wildlife because it may be difficult for haul trucks carrying heavy loads to avoid obstacles in the road. Therefore, accidental injuries or deaths of wildlife such as small mammals and reptiles that frequent the project area could occur from vehicular collisions from increased construction traffic. Mitigation measures specifically used to avoid impacts to desert tortoise would reduce the risk of road mortality of other species during construction. These mitigation measures are discussed under "Threatened and Endangered Species" section below and in appendix B.

During the construction period, wildlife would be intermittently exposed to noise and visual disturbances from the use of heavy equipment and machinery, increased traffic and hauling, and increased human presence. Increases in noise levels or visual disturbances in an area can temporarily or permanently alter wildlife behavior by disrupting communication and feeding patterns. In general, a growing number of studies indicate that animals, like humans, are stressed by noisy environments (Shannon et al. 2015). Noise levels would be greatest during construction of the new roadway; however, wildlife in the project area is likely habituated to a degree of noise and visual disturbance because Kelso-Cima and South Kelbaker Roads experience frequent traffic. Although the presence of construction equipment and crews necessary for the roadway improvements would temporarily disturb wildlife, these impacts would not be noticeable over the long term because most of the project area has been previously disturbed, and noise levels would return to baseline conditions after construction is completed. Impacts related to noise and visual disturbances would be mostly limited to temporary disturbances to individuals and would not affect species at the population or community level.

Additionally, as a result of alternative 2, habitats used by wildlife would likely need to be altered through the removal of vegetation and the expansion of the road, including the addition of pullouts and new shoulders, to increase the impervious surface area needed for roadway rehabilitation. Most project activities would fall within the existing roadway prism; however, habitat disturbance adjacent to the roadway would occur as a result of the proposed roadway realignment in certain places along the corridor, as well as the inclusion of the recessed vertical barriers. Areas adjacent to the roadway do not provide high-quality habitat for wildlife because these areas are previously disturbed, sparsely vegetated, and are exposed to noise and visual disturbances from vehicle traffic. Therefore, the small amount of habitat that would be lost as a result of project activities, relative to the amount available surrounding habitat, would not likely have a measurable effect on wildlife. To mitigate impacts from habitat loss, the NPS would provide habitat restoration in disturbed areas outside the roadway. Vegetation along the proposed roadway realignment areas would be removed, and some vegetation, including cactus, yuccas, and Joshua trees, would be salvaged for relocation, as described above. As a result of the roadway realignment, asphalt from the existing roadway would be removed at Cima Junction. Afterward, the soil would be decompacted and revegetated using seeds and salvaged plants. Habitat restoration would include alleviating soil compaction, revegetating with native seed, native, nursery-grown plants and plants salvaged prior to construction and adding rocks and woody debris to a disturbed area.

Although alternative 2 is anticipated to have short-term, adverse impacts on terrestrial wildlife during construction, long-term benefits are anticipated after construction, as a result of reducing the speed limit, implementing additional wildlife crossing structures, and installing exclusion fencing and recessed vertical barriers. These structures would improve wildlife connectivity, provide a safe route for wildlife to

cross the roadway, and increase the overall available area for desert tortoises since they would be able to occupy areas immediately adjacent to the fence without the risk of being struck by vehicles. Overall, the project is expected to have short-term, adverse impacts as well as long-term, beneficial impacts on terrestrial wildlife.

Threatened and Endangered Species

Federally and State-Listed Species – Desert Tortoise

Implementation of this alternative may directly affect the desert tortoise and designated critical habitat, including disturbance during construction and loss of habitat. Alternative 2 would result in the loss of approximately 150 acres of desert tortoise critical habitat, resulting in long-term, adverse impacts. Although a considerable amount of habitat would be permanently lost, this habitat consists mainly of long, narrow strips of previously disturbed land along either side of the roadway that does not offer high-quality habitat for the desert tortoise. Additionally, desert tortoise populations adjacent to the roadway are likely already depressed, compared to surrounding habitats, because of the road zone effect. A study by Boarman and Sazaki (2006) found that the populations of tortoises adjacent to roadways were depressed out to 400 meters and stabilized at 800 meters (Boarman and Sazaki 2006). Another study found that population abundance may be reduced up to 1–4 kilometers from a road (von Seckendorff Hoff and Marlow 2002). Because habitat loss would occur in these narrow strips adjacent to the road, it would not compromise the space needed for movement, dispersal, and foraging to support viable populations of desert tortoise. If vegetation is allowed to grow along road shoulders, it could improve the quality of roadside habitat by providing shade. Peaden et al. (2017) found that carapace temperatures of Mojave desert tortoises were influenced by their proximity to roads. Tortoises near roads experienced higher temperatures, likely due to the heat generated by the asphalt, which could affect their thermoregulation and overall health. Mitigation measures, such as the implementation of tortoise crossing structures, exclusionary fencing, and recessed vertical barriers could offset long-term impacts, as well as provide long-term, beneficial impacts to the critical habitat by improving connectivity and reducing mortality.

The application of water to control dust during construction may attract desert tortoises to the area because they are often drawn to roads with water, placing them at higher risk of injury or mortality. Tortoises may also seek shade by taking shelter under parked vehicles and could be killed, injured, or harassed when the vehicle is moved. Impacts may also occur from transportation and access within the project area because this species is mobile and likely to traverse the project roadways where it may be killed or wounded by vehicles, including construction vehicles. Construction-related impacts would primarily result in short-term, adverse impacts. To alleviate impacts, project-related vehicles and equipment would be limited to designated roads and areas identified as being permanently or temporarily affected by construction within the proposed project area. Motor vehicle speeds along project routes within desert tortoise habitat would not exceed 45 m and groups of three or more large trucks would be guided by a biological monitor pilot vehicle. Additionally, the NPS would require all personnel involved in activities to inspect the ground under vehicles any time a vehicle or piece of construction equipment is parking in desert tortoise habitat (outside the areas with desert tortoise fencing).

Other causes of impacts due to construction would include noise and visual disturbances, which could result in increased stress, altered foraging behavior, damaged hearing, and degraded communication (Barber et al. 2009; Pater et al. 2009). However, as previously described under “Terrestrial Wildlife,” wildlife in the project area, including the desert tortoise, are likely habituated to a degree of noise and visual disturbance from the UPRR line that runs parallel to Kelso-Cima Road as well as the frequent traffic on Kelso-Cima and South Kelbaker Roads. These impacts would not be noticeable over the long term because most of the project area has been previously disturbed, and noise levels would return to baseline conditions after construction is completed. Adverse impacts associated with noise and visual disturbances are anticipated to be short term and would not affect the desert tortoise at the population level.

Although short-term, adverse impacts to the desert tortoise could occur during the construction period, initial desert tortoise surveys indicate low tortoise occupancy along the Kelso-Cima Road corridor, with two potential tortoise burrows of recent activity being observed. The low number of observations is likely due to long-term, persistent vehicle strikes (Hughson and Darby 2013). During periods of increased rainfall and associated plant growth, opportunities for desert tortoise encounters increase, however, it is still anticipated that encounters with desert tortoises during construction activities would be minimal, overall. Although increased levels of activity are anticipated to have short-term, adverse impacts on individual desert tortoises, there would be no appreciable effect on the overall function of critical habitat. The activities would be dispersed over a large area, and the Preserve would limit the area of disturbance and, consequently, the amount of disturbance and human-caused mortality.

Project design features such as exclusionary fencing, recessed vertical barriers, and tortoise crossing structures would result in long-term, beneficial impacts for the desert tortoise as well as their critical habitat. The exclusionary fencing would prevent tortoises from entering roads while the crossing structures would reduce habitat fragmentation and provide safe passage across roadways, allowing tortoises to move between different parts of their habitat without exposure to traffic; this would help maintain overall population health and provide greater access to resources.

Because of the potential impacts that could occur as a result of alternative 2, the USFWS assessed the proposed project activities and issued a formal Programmatic Biological Opinion. The Biological Opinion reviewed the current status of the desert tortoise, the environmental baseline for the action area, the effects of the proposed action, and the reasonably foreseeable impacts. The USFWS came to the conclusion that the activities are not likely to jeopardize the continued existence of the desert tortoise for the following reasons:

- The proposed activities will not affect the reproductive capacity of desert tortoises.
- The activities will not appreciably reduce the number of desert tortoises within the action area and, by extension, throughout the range of desert tortoises.
- The proposed activities will not appreciably affect the distribution of desert tortoises.
- The activities considered will not appreciably diminish the ability to recover desert tortoises.

Additionally, the USFWS determined that the protective measures ensured minimal disturbance, and the project activities were not likely to result in the destruction or adverse modification of desert tortoise critical habitat.

Federally Listed Species – Monarch Butterfly

The vegetation community types present within the Preserve include milkweed, which makes it suitable habitat for the monarch butterfly. However, the milkweed present in the Preserve is most often associated with riparian habitats, which are not present in the project area. Although high-quality habitat for the monarch butterfly does not exist in the project area, the species has a large distribution range and could occasionally be present where project activities are occurring. There would be some disturbance to vegetated areas during construction that could temporarily displace monarch butterflies. Where feasible, disturbed areas would be revegetated with a native seed mix upon completion of construction, potentially restoring habitat for monarch butterfly. Due to the temporary nature of impacts and the lack of high-quality suitable habitat within the project area, impacts to the monarch butterfly are anticipated to be minimal.

State-Listed Species – Gilded Flicker

The project area is limited in vegetation and does not have dense concentrations of large cacti necessary for the gilded flicker to nest; however, it does provide suitable foraging habitat. Because project activities would involve the removal of vegetation suitable for foraging, the gilded flicker could experience short-term, adverse impacts from the loss of foraging habitat. Individual birds that frequent the project area for

the purpose of foraging may be disturbed by construction-related noise and activity, ultimately displacing the species from critical areas and disrupting their foraging behaviors. Although the project would result in a loss of foraging habitat and cause temporary disturbances through noise and increased levels of activity, there is suitable gilded flicker foraging habitat outside the project area. Additionally, the NPS would salvage and replant certain individual plants and revegetate using native plants, which would minimize the impact of loss of foraging habitat. Therefore, the project is not anticipated to result in long-term, adverse impacts or impact the species at the population level.

Reasonably Foreseeable Impacts

Past, ongoing, and reasonably foreseeable actions include the reconstruction of road segments to improve safety within the Preserve, the rehabilitation of Cima Road, pavement pulverization on Morning Star Mine Road, routine maintenance and emergency repairs in the Preserve, and road safety improvements at Mojave National Preserve. Past actions such as the reconstruction of road segments within the Preserve, the rehabilitation of Cima Road, and routine maintenance and emergency repairs resulted in short-term, adverse impacts during the construction period; however, both projects resulted in long-term, beneficial impacts for biological resources from the implementation of low-water crossings and tortoise fencing. These previous actions provided flood resiliency for the site as well as reduced erosion and flood damage. Similarly, the pavement pulverization on Morning Star Mine Road, a reasonably foreseeable action, would also provide long-term benefits to biological resources through reduction of vehicle speeds, which ultimately would decrease tortoise-vehicle collisions.

Under the no-action alternative, continued mortality of desert tortoise in road corridors with the existing poor conditions would result in long-term, adverse impacts. When combined with the effects of past, ongoing, and reasonably foreseeable actions, the no-action alternative would contribute a slight adverse increment to the overall negative reasonably foreseeable impact on biological resources, specifically the threatened desert tortoise.

Under alternative 2, construction activities would result in noise, visual disturbances, habitat modification, and the removal/alteration of vegetation, which would have short-term, adverse impacts on biological resources. However, the proposed improvements would result in long-term, beneficial impacts from the implementation of wildlife protection measures. When combined with the effects of past, ongoing, and reasonably foreseeable actions, alternative 2 would contribute short-term, adverse impacts to biological resources. However, it would also provide long-term beneficial impacts and contribute to the overall beneficial reasonably foreseeable impacts in the surrounding project area.

GEOLOGIC FEATURES AND SOILS

Affected Environment

The project area is part of the physiographic region known as the Basin and Range Province and is characterized topographically by mountain ranges that rise steeply and abruptly from the desert floor, interspersed with broad, gently sloping valleys, and faulting. The project area is flanked by the Providence Mountains on the east and Kelso Mountains on the west. The geologic history of the region is significant, with the oldest exposed rocks dating back 1.7–2.5 billion years (early Proterozoic), including metamorphic rocks derived from sedimentary, volcanic, and igneous (intrusive) rocks. Similar rocks have been found along the Colorado River in the Grand Canyon, indicative of the mountain-building events in the area. Around 1.4 billion years ago, tectonic activity structurally altered the region, leading to erosion that flattened the landscape. Tectonic activity continued, causing folding and faulting in the sedimentary rocks, and the region became an active margin, developing a volcanic arc during the Jurassic and mid-Cretaceous periods. This introduced igneous rocks, primarily granite and batholithic intrusions. Proterozoic and Paleozoic age carbonate rocks, such as limestone and dolostone, are prevalent and resistant to erosion in arid climates. Dolostone is a secondary mineral replacement of calcite and is

abundant in fossils. Granitic rocks in the region break down into quartz and feldspar-rich coarse sandy soils (Stoffer 2004). Geologically, the Mojave Desert consists of a complex landscape shaped by tectonic activity, with features such as faults, volcanic fields, alluvial fans, ephemeral streams/drainages, and aeolian dunes.

Many of the valleys and desert flatlands are largely mantled by unconsolidated or poorly consolidated Quaternary surface deposits, sometimes covered by desert pavement or biological soil crusts, and cut by ephemeral streams and washes. Soils with medium textures and with calcium carbonate (e.g., caliche) accumulations are common. The US Department of Agriculture Natural Resources Conservation Service Web Soil Survey indicates that the soils in the project area consist of 17 map units. A map unit is a grouping of soils by their natural landscapes and patterns. Table 2 displays the acres and slope of each soil type in the project area.

Approximately two-thirds of the project area consists of soil complexes containing the Arizo, Orwash, and/or the Carrizo series. The Arizo series present as part of the Arizo-Orwash complex, Yuccabutte-Arizo association as well as Arizo loamy sand, as displayed in Table 2. The Orwash series is also present in the Uxo-Orwash complex. The characteristics of these predominant soil series include:

- **The Orwash series** consists of very deep, somewhat excessively drained soils that formed from mixed alluvium derived from granitic sources. Orwash soils are on fan aprons, fan skirts, and alluvial flats. Slope ranges from 2 to 8% in the project area. Mean annual precipitation is about 6 inches, and mean annual temperature is about 59°F (USDA-NRCS 2015a).
- **The Arizo series** consists of very deep, excessively drained soils that formed in mixed alluvium. Arizo soils are on recent alluvial fans, inset fans, fan apron, fan skirts, stream terraces, floodplains of intermittent streams and channels. Slope ranges from 2 to 15% in the project area. The mean annual precipitation is about 180 millimeters (7 inches), and the mean annual temperature is about 17 degrees Celsius (°C) (62°F) (USDA-NRCS 2015b).
- **The Carrizo series** consists of very deep, excessively drained soils formed in mixed igneous alluvium. Carrizo soils are on numerous landforms on flood plains, fan piedmonts, and bolson floors. Slopes range from 2 to 8% in the project area. The mean annual precipitation is about 100 millimeters (4 inches), and the mean annual air temperature is about 21.5°C (71°F) (USDA-NRCS 2013).

TABLE 2. APPROXIMATE ACREAGE BY SOIL TYPE AND SLOPE RANGE IN THE PROJECT AREA

Series or Unit	Slope Range in Project Area (%)	Approximate Acres in Project Area	Approximate Percent of Project Area
Arizo-Orwash complex	2 to 8	191	35%
Carrizo gravelly fine sandy loam	2 to 8	114	21%
Centennial gravelly loamy sand	4 to 8	73	13%
Minehart gravelly fine sandy loam	2 to 8	49	9%
Arizo loamy sand	2 to 8	28	5%
Yuccabutte-Arizo association	2 to 15	17	3%
Uxo-Orwash complex	2 to 8	16	3%
Dalelake association	2 to 30	14	2%
Fenner sandy loam	0 to 4	12	2%
Dragonwash coarse sand	2 to 8	9	2%

Series or Unit	Slope Range in Project Area (%)	Approximate Acres in Project Area	Approximate Percent of Project Area
Cajon sandy loam	2 to 8	7	1%
Vegasglow very gravelly sandy loam	15 to 50	7	1%
Roxie-Coppermine-Copperworld complex	8 to 60	6	1%
Newera-Noshade association	2 to 15	6	1%
Mormount family-Splotter family complex	2 to 30	3	1%
Boomerang-Newkirk complex	2 to 8	1	<1%
Morongo complex	2 to 8	0.5	<1%

Source: USDA-NRCS 2024

Trends and Planned Actions

Historical records have shown that the Preserve is prone to floods and droughts that are expected to become more severe with increasing temperature fluctuations and precipitation patterns (Diffenbaugh et al. 2005; Kharin et al. 2007; Loehman 2010). The Preserve is located in the rain shadow region of the San Gabriel and San Bernardino Mountains, which causes extreme heat in the summers and very cool winters. This region is susceptible to El Niño and La Niña events, with El Niño events producing greater precipitation, and La Niña events producing greater drought conditions. On record, the wettest seasons occurred in 1976 and 1998, while a recent longer drought occurred between 2011 and 2017 (NIDIS n.d.; Abatzoglou et al. 2009; Hughson et al. 2011). As the impacts of unprecedented weather events become more apparent, soil conditions could change. Higher intensity and more frequent rainfall may lead to more erosion on susceptible soils along the project area and an increase in runoff when soils reach saturation levels.

Past, ongoing, and reasonably foreseeable actions that could affect geological features and soils include past roadway improvement projects, ongoing routine maintenance and emergency repair activities, and future roadway improvement projects. Routine maintenance and repair activities are conducted on an as-needed basis and include patching, repaving, and restriping roadway surfaces. These actions could affect surface soils if maintenance equipment containing fluids spill and contaminate surface soils. The roadway improvement projects could include excavating and removing surface soils, installing road base materials, and completing the driving surface. These actions could result in increased surface runoff into the surrounding areas and the introduction of road pollution to those areas.

Environmental Consequences

Alternative 1: No-Action Alternative

The no-action alternative would retain the existing surficial soils, geologic features, and subsurface materials intact within the project area along the 42 miles of Kelso-Cima and South Kelbaker Roads. Surficial soils correspond to materials within inches of the surface—commonly referred to “topsoil.” Geologic features describe those that are created by geologic processes such as bedrock outcrops. Subsurface materials are those that generally require tools or machinery to reveal. Under the no-action alternative, the NPS would continue operating and maintaining existing roads. Kelso-Cima and South Kelbaker Roads would remain unchanged. Therefore, there would be no impacts to the current condition of the surficial soils, geologic features, and subsurface materials associated with geologic and

geotechnical investigations, demolition, or construction activities. Ongoing weathering, erosion, runoff, flooding, and tectonic forces would continue to affect surficial soils and geologic features. Furthermore, the impacts of unprecedented weather events may exacerbate soil erosion as a result of increased runoff and more frequent pulses of large-scale flash flooding. Ongoing impacts to soil would continue from current maintenance, repairs, and erosion control measures.

Alternative 2: Proposed Action

Soils and Subsurface Materials

Under alternative 2, the NPS would rehabilitate and improve safety along the corridor, which would include ancillary activities related to material transport, disposal, staging areas, and roadway detours. Alternative 2 would affect the existing soils and subsurface materials during preliminary investigations and construction-related activities.

Prior to construction, geologic, geotechnical, and/or geophysical investigations would be conducted to assess subsurface materials. These activities could range from foot traffic for geologic field mapping to exploratory machinery for geotechnical and geophysical investigations. The primary geotechnical and geophysical equipment would include equipment with drilling, penetration, and vibration apparatuses. Short-term, adverse impacts to surficial soils would result from foot traffic and wheel tracking along non-roadway areas, including near Cima Junction. During field investigations, drilling and penetration testing would break through asphalt and soil surfaces to extract soil samples and data. The sampling depths for exploratory drilling could range from a few feet or more at a given interval within the project area or within specified improvement zones, like the Granite Pass parking area and new welcome area. All bore holes would be backfilled using prescribed methods to minimize surface settlement. Although the backfilled bore holes would create long-term impacts on the subsurface, the surface impacts would be short term. Geophysical testing, such as seismic and electromagnetic methods, are primarily noninvasive; therefore, field investigations would not result in long-term, adverse impacts on surficial soil or geologic features.

However, construction-related activities would adversely affect soils and subsurface materials. The initial demolition of existing roadways, parking lots, and associated structures would have short-term, adverse impacts on surficial soils and geologic features. Primary areas of impacted surficial soils would be along non-roadway haul routes and temporary soil storage areas from tracking by heavy equipment. Construction activities along the proposed roadways, parking lot, welcome area, and associated structures would affect surficial soils, geologic features, and subsurface materials, primarily where deeper grading, benching, filling, and cutting is required. Areas that could experience long-term, adverse soil and subsurface materials impacts include the proposed roadway realignments, pullouts, parking area, welcome area, low-water crossing structures, recessed vertical barriers, and tortoise exclusion fencing, which would require prescribed excavations into natural materials.

Soils and geologic features would be impacted differently according to their soil types and properties. Furthermore, tectonically active areas, such as the Mojave Desert, produce variable depositional systems that generate distinct soils and subsoils. Most of the project area is underlain by Quaternary alluvial deposits within gently sloping mountain aprons. In general, and according to their corresponding soil properties, the alluvium is granular and excessively drained. Their erodibility and runoff rates could also vary. Therefore, surficial soils would be impacted differently depending on their location along the project corridor, age, and physical properties. Similarly, project areas that intersect ephemeral streams or drainage channels would consist of loose and unconsolidated alluvial deposits. Impacts to younger surficial deposits would be short term and adverse while impacts on older, more established deposits would be long term and adverse. Although impacts on younger deposits would be short term and adverse, these deposits are more prone to impacts due to their unconsolidated nature. Older deposits are typically more indurated, therefore, more resilient to impacts. Soil stabilization and shoring could help minimize short-term, adverse impacts. The project area near Granite Pass and Cima Junction provides the two main

zones of surface and shallow bedrock. Short-term, adverse impacts would include subsurface excavation of bedrock, wheel tracking, and minor grading disturbance of the bedrock and surficial soils during construction.

Arid environments are known to produce semi-impervious to impervious surfaces and subsurfaces. Desert pavement, as it is generally known, is an assemblage of equal-sized pebble clasts that create an armor-like flat ground surface. The armoring clasts are typically covered in desert varnish with stronger varnish development over time. Desert pavement is known to exist in the project area. All desert pavement was formed during the Late Pleistocene, and any damage to desert pavement would be considered permanent. Arid desert environments are also necessary for the formation of calcrete, a hardened soil layer formed by the leaching of calcium carbonate from upper soil horizons that can be between a less than an inch to several feet in thickness and can be at the surface. It is unknown if calcrete exists in the project area. Because desert pavement and calcrete can be hard and/or impervious surface and subsurface layers, disturbing them could disrupt erosional and drainage patterns. During rainfall events, areas of desert pavement and surface calcrete are not able to quickly absorb water, which could result in higher runoff rates, especially in lower elevation drainage paths. Therefore, diversions of historic stream and drainage paths from disturbed desert pavement or calcrete could have long-term, adverse impacts on soils. Furthermore, areas of disturbed desert pavement or calcrete adjacent to alluvial soils could increase soil erosion during storm events. Water could find a new flow path in areas of disturbed desert pavement or calcrete, resulting in additional runoff and erosion. Because the project area is limited primarily to either side of the proposed roadway, soil and geologic impacts would result in short-term, adverse impacts if areas of excavated calcrete are supported by engineered structures, such as riprap.

Alternative 2 would adversely impact surficial soils, geologic features, and subsurface materials in the short and long term. In general, short-term impacts to surficial soils and geologic features would be limited to preconstruction activities. Whereas long-term, adverse impacts to surficial soils and geologic features would be the result of construction-related activities, including the proposed roadway realignment, pullouts, parking area at Granite Pass, communications tower at Cima Junction, low-water crossing structures, recessed vertical barriers, tortoise exclusion fencing, and other proposed permanent features. However, these impacts would be mitigated by adhering to the resource protection measures listed in appendix B, including minimizing soil disturbance; implementing erosion control measures; and siting of staging and storage areas for construction vehicles, equipment, materials, and soils in previously disturbed or paved areas.

Reasonably Foreseeable Impacts

Past, ongoing, and reasonably foreseeable actions include the reconstruction of road segments for safety improvements, rehabilitation of Cima Road, routine maintenance and emergency repairs in the Preserve, and the pavement pulverization on Morning Star Road. Past actions, including the rehabilitation of Cima Road, road safety projects, routine maintenance and emergency repairs, and the reconstruction of road segments in the Preserve resulted in short-term, adverse impacts on geological features and soils during the construction period. These activities involved preliminary investigations, demolition, excavation, soil removal, and new permanent structures. Similarly, reasonably foreseeable actions, such as the pavement removal on Morning Star Mine Road would also result in short-term, adverse impacts on geological features and soils during the construction period due to pavement pulverization and soil removal.

Under the no-action alternative, there would be no direct adverse impacts on geological features and soils from preconstruction, construction, or new permanent structures. However, long-term, adverse impacts on geological features and soils could continue from weathering, erosion, flooding, runoff, and tectonic forces. These impacts could increase wind and stream erosion and contribute to runoff and sediment build up along natural drainages intersecting the roadways and associated structures. Maintenance activities, such as asphalt repair, culvert cleaning, and the retaining of sediment where necessary, would continue. When combined with the effects of past, ongoing, and reasonably foreseeable actions, the no-action

alternative would not directly contribute an adverse increment to the overall reasonably foreseeable impact on surficial soils, geologic features, or subsurface materials surrounding the project area.

Under alternative 2, preconstruction and construction activities would result in short-term and long-term, adverse impacts to surficial soils, geologic features, and subsurface materials. Short-term, adverse impacts would occur from foot traffic and wheel tracks. Long-term, adverse impacts to soils and bedrock mass would occur from the excavation and grading of soils and bedrock from the addition of permanent structures such as new roadway beds, pullouts, the Granite Pass parking area, communications tower at Cima Junction, low-water crossing structures, safety road signs, recessed vertical barriers, and tortoise exclusion fencing. Additionally, long-term, adverse impacts to soil and bedrock would occur from any subsurface investigations, such as geotechnical drilling; however, bore holes are not considered adverse once backfilled. When combined with the effects of past, ongoing, and reasonably foreseeable actions, alternative 2 would contribute short-term, adverse impacts to the surficial soils, and long-term, adverse impacts to geologic features and subsurface materials, as well as contribute an overall reasonably foreseeable impact on surficial soils, geologic features, or subsurface materials surrounding the project area.

CULTURAL RESOURCES

Affected Environment

The regulations implementing section 106 of the National Historic Preservation Act (NHPA) (36 CFR 800) define a historic property as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (National Register) maintained by the Secretary of the Interior." NPS Director's Order 28, *Cultural Resource Management*, directs the NPS to "protect and manage cultural resources in its custody…"

The NPS developed the area of potential effects (APE) for historic properties to encompass the estimated limits of construction for the project within which ground disturbance associated with construction activities may occur. The APE also includes proposed staging areas and areas where visual or auditory effects related to the project may occur. The APE totals approximately 557 acres, of which 313 acres are along Kelso-Cima Road and 244 acres are along South Kelbaker Road. In most areas, the vertical APE extends 1 to 2 feet below the existing grade (approximate depth of excavation from the asphalt removal); however, in select areas, the depth of excavation may extend up to 5 feet below the existing grade if vertical adjustments to the road profile are required.

Several detailed cultural resource surveys were previously completed in the project area and APE, and the findings are included in this affected environment. The previous surveys include:

- Archeological Survey Report in Support of the Kelso-Cima Road and South Kelbaker Road Rehabilitation Project (Guttenberg et al. 2024).
- Archeological Resources Survey in Support of the Kelso-Cima Road and South Kelbaker Road Rehabilitation Project (NPS 2025).
- National Register Nomination, Kelso Depot (NPS 2000a) and Boundary Increase (NPS 2021).
- Cultural Landscape Inventory, Rock Springs Land and Cattle Company, Mojave National Preserve (NPS 2007).
- Cultural Landscape Inventory, Vulcan Mine Historic District, Mojave National Preserve (NPS 2011b).
- Cultural Landscapes Inventory for the Kelso Depot Historic Site, Mojave National Preserve (NPS 2001).

- WACC Project No. MOJA 2000 C: Archaeological Testing and Assessment at Kelso Depot, Mojave National Preserve, San Bernardino County, California (Wilson and Neff 2000).
- The Kelso Depot – An Archeological Evaluation (Daron 1997).

The APE was developed to guide the archeological inventory efforts required for compliance with 36 CFR 800.4 (Identification of historic properties) and may be refined as project design progresses and more details become available. Effects on archeological resources would be limited to areas in the APE where ground disturbance would occur, but the APE also includes other areas the proposed changes may visually affect that may result in additional effects on historic and ethnographic resources, if present.

Historic Structures, Districts, and Landscapes

Three National Register-listed HDs are within the APE: the Rock Springs Land and Cattle Company (RSL&CC) HD, Kelso Depot, Restaurant, and Employees Hotel HD, and the Vulcan Mine HD, each of which has a defined cultural landscape and various contributing structures and features.

The RSL&CC HD is significant for its association with the rise of cattle ranching and related industry in California between 1894 and 1954. Overall, the RSL&CC HD comprises the facilities of three former ranch operations; it encompasses about 854,000 acres of high desert in the Preserve, although individual contributing features like buildings, structures, roads, pipelines, objects, and historic vegetation, only occupy approximately 200 acres of the total HD area. The HD retains integrity as an intact network of sites, defined as clusters of various individual features based on the site's historic function, and broader landscape characteristics. The northern half of the project corridor along Kelso-Cima Road overlaps the HD boundary from Cima Junction to a point approximately 2 miles north of Kelso. The primary contributing features present in the APE are the UPRR, Kelso-Cima Road, and Kelbaker Road; portions of Cima and Cedar Canyon Roads are also in the APE where they intersect Kelso-Cima Road. These roads represent components of the circulation system and help to define the spatial organization and cluster arrangement that contribute to the landscape's significance. No other identified contributing sites are present in the APE. The former Kessler Springs Ranch Headquarters on Cima Road, 4 miles northwest of Cima, is the closest center of ranching activity to the APE.

The historic structures and cultural landscape associated with the development of the railroad town of Kelso and Kelso Depot, founded in 1904, are listed in the National Register as the Kelso Depot, Restaurant, and Employees' Hotel Historic District (Kelso HD) (P-36-003053). The contributing resources located within the Kelso HD are detailed in Table 3.

TABLE 3. KELSO HISTORIC DISTRICT CONTRIBUTING RESOURCES

Element	Description	Date
Kelso Depot, Restaurant, and Employees' Hotel (P-36-015498)	Two-story, 11,600 square-foot Mission Revival-style building	1924
Coal and Supply Shed	9 x 12-foot wood-floored coal house expanded to a 9 x 24-foot concrete-floored, wood-framed supply shed	1924
Schoolhouse	Single-story 1,332-square-foot building, converted to ranger station	1925
Teacherage	Single-story frame residence	c. 1925
Garage	Frame and shiplap building with a dirt floor	Post 1945

Element	Description	Date
Outhouse	Shiplap over frame structure with two restrooms labeled *boys* and *girls,* apparently associated with schoolhouse	Post 1945
Post Office and Lyman Store	Cast-in-place concrete building with remains of painted signage	c.1904–1964
Reservoir	Concrete structure	1904–1905
Other Water Features	Cornfield Spring concrete spring box, second concrete spring box, pipeline, dirt access road	1904–1905
Chicken Coop	Wood-framed structure with galvanized metal exterior	Post 1945
Ancillary Features	Earthen ramps, tamarisk trees, date palms, arcade, brick walkways, concrete walkways, concrete shafts with manhole covers, saw tooth brick planter borders, lighted signpost base; Kelso-Cima Road; Kelbaker Road	N/A

The 437-acre Vulcan Mine HD consists of the main mining complex (with an open pit iron mine, operational and residential areas, and road and terrace systems), as well as a transportation corridor and earthen loading ramps once used to transfer iron ore from the Vulcan Mine to railcars at Kelso. The mining complex is located about 4 miles from South Kelbaker Road and is visually screened from the project area by terrain; however, the boundary also includes the 9-mile Vulcan Mine-Kelbaker Road, a portion of which extends into the APE. This road alignment comprises three distinct sections. One section includes a 5.5-mile segment between the mine and South Kelbaker Road, and is the only contributing element to the HD. The other sections include the remaining 3-mile-long paved segment (now South Kelbaker Road) and the unmaintained traces of the 0.5-mile-long, loading ramp access road, just south of Kelso. Both of these sections of the road alignment are noncontributing to the HD due to a loss of integrity (NPS 2011b).

Other eligible or potentially eligible resources in the project area include:

- The San Pedro, Los Angeles, and Salt Lake Railroad (now UPRR) (P-36-001910 / CA-SBR-1910H).
- The Old Mojave Trail (P-36-003033 / CA-SBR-3033H), disconnected remnants of a historic trail through the desert.
- The Southern California Edison Lugo-Mohave Transmission Line (P-36-027757).
- The hamlet of Cima (P-36-003054/CA-SBR-3054H). The hamlet includes a wye track and siding, a store, post office, boarding house, several cabins, and other structures. It has not been formally evaluated for National Register eligibility but was in poor condition during the 2024 survey.
- A former (historic-period) corral area located near NPS employee housing at Kelso. It consists of an area with a small shed structure and various discarded materials and debris, enclosed by a wire fence with wooden posts. It has not been formally evaluated for National Register eligibility but is in poor condition.

Archeological Resources

An archeological survey of the project area was completed in March 2024 (Guttenberg et al. 2024). One prehistoric site (MS-001) and seven prehistoric isolates (MS-ISO-001 through MS-ISO-007) were identified in the APE, but these resources were recommended not eligible for listing in the National Register. Additionally, a historic-period trash feature (Feature 1) was evaluated and recommended as a noncontributing element to the National Register-listed Kelso HD (P-36-003053). MS-001 is a low-density scatter that lacks clear temporal or prehistoric significant association, and Feature 1 lacks integrity and any artifacts of special interest; therefore, these resources have limited data potential and cannot produce information that would provide a better understanding of past human behavior, cultural adaptation, and related topics.

Kelbaker Road is a contributing feature to landscapes associated with the RSL&CC and Kelso HDs; however, most of South Kelbaker Road within the APE (between just south of Kelso Depot and I-40) is not located within the boundaries of a known HD or cultural landscape. As such, this portion of the road was documented and recommended not eligible for listing in the National Register as an individual linear resource, or a contributing feature to a larger district or landscape aside from those already recorded. Prehistoric site P-36-001100 had previously been mapped as within the APE, but during the 2024 archeological survey, it was found to be located outside the APE. Southern California Edison's Lugo-Mohave 500-kilovolt transmission line corridor (P-36-027757) passes through the project area, but no contributing elements of the line are located in the APE.

An additional archeological survey of the new entrance sign area on South Kelbaker Road was completed in January 2025 (NPS 2025). The Preserve archeologist surveyed the area using 15-meter transects, and data were collected through Environmental Systems Research Institute Field Maps using a submeter global positioning system device. No cultural material was identified in the APE as part of this survey.

However, the 2024 archeological survey identified several locations that were considered to have the potential for archeological remains. These areas are associated with historic resources in Cima and Kelso and are discussed in more detail below.

Ethnographic Resources

No ethnographic resources have been documented within the APE. However, pictograph sites are present within 1 mile of the APE. The NPS initiated consultation on January 11, 2024, with five federally recognized Tribal Nations, including the Colorado River Indian Tribes, Chemehuevi Indian Tribe, Fort Mojave Indian Tribe, San Fernando Band of Mission Indians, and the Twenty-Nine Palms Band of Mission Indians to determine whether unrecorded ethnographic resources may be present. Consultation on the project is ongoing; however, no responses or information regarding ethnographic resources were received in response to the January 2024 letter.

Trends and Planned Actions

The NPS's Cultural Resources Strategy establishes goals to preserve and maintain cultural resources as the environment continues to warm. Rising temperatures expedite crystallization of efflorescent salts from increased evaporation rates, which can lead to higher rates of deterioration of the historic structures and archeological resources in the project area (NPS 2016a). Unprecedented weather changes in the California desert region are anticipated to include higher summer temperatures, longer droughts, and episodes of severe winter flooding. Increased variation in rainfall amounts may have a greater impact on cultural resources associated with ranching, such as fences, corrals, and wooden buildings. Unprecedented weather events can threaten archeological resources and landscape features from erosion, inundation, heat, and chemical alteration. Ranching-related resources are currently decaying under existing conditions, and unprecedented weather events could accelerate these processes. If other catastrophic weather events become more frequent in the Preserve because of warming temperatures, cracking and other physical damage may occur and could further degrade historic cultural resources in the project area.

Past, ongoing, and reasonably foreseeable actions that could affect cultural resources include past roadway improvement projects, ongoing road maintenance activities, and future roadway improvement projects. The Preserve includes numerous resources dating back to the 20th century that are built of wood or sheet metal, are vulnerable to decay, and require ongoing maintenance by the NPS. However, keeping up with the maintenance is a particular problem when the resources, such as fences and watering stations, are widely distributed. Some dirt roads also require regular vegetation clearing. These actions may alter the visual character of the landscape. Because the roads are contributing elements to the cultural landscapes in the Preserve, the impacts of the current project must be evaluated as part of the overall impact on these cultural landscapes.

Environmental Consequences

Alternative 1: No-Action Alternative

Under the no-action alternative, the current alignment would remain unchanged, and archeological resources, cultural landscapes, and historic structures would remain unaffected. There would be no impact on the archeological resources, cultural landscapes, or HDs that would diminish their integrity. Preserve staff would perform periodic maintenance and repairs to maintain the roadway, and the NPS would follow NPS *Management Policies 2006* and *Cultural Resource Management Guidelines* (NPS 2006, 1998), as well as requirements of the NHPA, for continued treatment of cultural resources in the area.

The existing roadway would likely need more maintenance and repairs over time as road surface conditions decline. Additionally, continued erosion, sedimentation, and flooding events could further damage those resources and their existing state of integrity. While the no-action alternative would not have new impacts on the archeological resources or HDs in the project area, elements of those resources could continue to decline, resulting in an adverse impact over the long term.

Alternative 2: Proposed Action

Historic Structures and Cultural Landscapes

Kelso Historic District and Kelso Depot

Under alternative 2, the proposed roadway rehabilitation and improvements in the project area would not constitute an adverse effect to the Kelso HD (P-36-003053) or Kelso Depot (P-36-015498). The proposed roadway rehabilitation and improvements would be located primarily in the existing roadway prism, and no roadway widening or realignment of Kelso-Cima or South Kelbaker Roads within the HD is proposed to minimize alterations to these contributing landscape resources. Furthermore, no tortoise exclusion fencing would be installed around Kelso Depot to avoid the introduction of new structures and to minimize visual impacts to the landscape. Therefore, the proposed improvements under alternative 2 would not diminish the integrity of design, setting, materials, workmanship, feeling, and association of the historic, designed cultural landscape. Current designs would avoid direct impacts to the Kelso HD and Kelso Depot; however, to mitigate any inadvertent adverse effects, the area would be designated a high-sensitivity area during construction, and additional monitoring would be required.

Vulcan Mine Historic District

Under alternative 2, the proposed roadway rehabilitation and improvements in the project area would not constitute an adverse effect to the National Register-listed Vulcan Mine HD. Most of the portion of the HD boundary that overlaps the APE includes the noncontributing section of South Kelbaker Road. The only contributing resources to the HD within or directly adjacent to the APE are the loading ramps (west side of South Kelbaker Road) and Vulcan Mine Road where it intersects South Kelbaker Road; however, the proposed improvements in these areas would be largely limited to the existing roadway prism to minimize effects to the HD and nearby contributing resources. Specific work proposed under alternative 2 would include the installation of tortoise exclusion fencing along both sides of South Kelbaker Road, approximately 7 to 14 feet from the proposed roadway edge. A drainage ditch would be constructed

directly adjacent to the west side of the roadway edge, and a pullout would be added on the east side of South Kelbaker Road opposite the loading ramps. Although these new elements would be within the HD boundary, they would not encroach upon the earthen loading ramp structures or otherwise alter the HD's contributing resources. Additionally, these new elements would not result in adverse visual effects. Furthermore, to mitigate any inadvertent adverse effects, the area would be designated a high-sensitivity area during construction, and additional monitoring would be required.

Rock Springs Land and Cattle Company Historic District

Under alternative 2, the proposed roadway rehabilitation and improvements in the project area would not constitute an adverse effect to the National Register-listed RSL&CC HD. The primary contributing features to the HD within the APE are Kelso-Cima Road, Cima Road (and the associated Cima Junction intersection), and the UPRR, all of which support the integrity of circulation as a landscape feature. Although the portion of Kelbaker Road within the APE is outside the HD boundary, it is still considered a contributing feature as a component of the overall circulation system.

Most improvements within the HD would be limited to the existing roadway prism and adjacent areas previously disturbed by road construction and maintenance. Select road widening (up to 2 feet on each side of the roadway), horizontal and vertical adjustments of the Kelso-Cima roadway profile, construction of roadside pullouts, realignment of the Cima Junction intersection, and installation of tortoise fencing and recessed vertical barriers would alter the contributing resources but not in a way that would compromise its eligibility for the National Register. The proposed improvements would not diminish the integrity of design, association, or location. Horizontal and vertical adjustments would be limited to select locations along Kelso-Cima Road and at Cima Junction and only affect approximately 0.7 miles, which represents a small portion of the entire Kelso-Cima and Cima Road corridors (approximately 19 and 17 miles, respectively). The improvements at Cima Junction would shift the intersection of Kelso-Cima and Cima Roads approximately 300 feet northwest to create a more gradual curve. This would also move the existing at-grade crossing of Kelso-Cima at the UPRR wye to a location about 200 feet northwest on the railroad wye. The affected roads and railroad (including the wye) would retain their overall historic alignments and spatial relationships to one another and to the contributing sites and features throughout the HD. Kelso-Cima and South Kelbaker Roads would remain paved, two-lane roads, and despite the introduction of new features like pullouts and tortoise fencing, the roads and surrounding landscape would continue to retain their rural character. Additionally, limited vegetation removal and changes to natural grades and surrounding topography would help to maintain the integrity of the setting and feeling.

Union Pacific Railroad

Under alternative 2, the proposed roadway rehabilitation and improvements in the project area would not constitute an adverse effect to the UPRR (P-36-001910/CA-SBR-1910H), which has been recommended eligible for the National Register as an individual resource (Tinsley Becker 2021) and a contributing circulation feature to the RSL&CC HD (NPS 2007). The UPRR is located adjacent to the Kelso-Cima Road portion of the project area and intersects it near Cima Junction and Kelso Depot. The UPRR has been regularly maintained and upgraded over the years. However, under alternative 2, the existing at-grade crossing on Death Valley Mine Road would be improved to provide 15-foot travel lanes in each direction for approximately 120 feet, and the proposed roadway ditches would also be re-graded to increase drainage and stability. Additionally, the existing at-grade crossing on South Kelbaker Road, near Kelso Depot, would be improved by re-grading the approach roadways to increase visitor safety, drainage, and stability. However, there would be no change in the alignment for either at-grade crossing. Proposed improvements along the project corridor would not alter any portion of the railroad corridor or any associated features. Therefore, alternative 2 would not have an adverse effect on this historic property, and no additional mitigation measures would be needed.

Union Pacific Railroad Communications Tower

Under alternative 2, the NPS, in conjunction with UPRR, would decommission and replace a UPRR communications tower, which was identified within the APE near Cima Junction. According to research conducted by NPS and gleaned from UPRR's design plans, the existing tower was established circa 1986. The tower's age was confirmed by historic aerial photographs that indicate the tower was not present in 1983 but was visible by 1994. Therefore, the communications tower does not meet the 50-year age criterion necessary to be considered a historic property and would not be subject to the section 106 review process.

Southern California Edison Lugo-Mohave Transmission Line

Under alternative 2, the proposed roadway rehabilitation and improvements in the project area would not constitute an adverse effect to the Southern California Edison Lugo-Mohave Transmission Line (P-36-027757). The transmission line has been determined eligible for listing in the National Register and the California Register of Historical Resources (3D, 3CD) under Criterion A/1 for its association with Southern California Edison's earliest 500-kilovolt transmission line systems conveying power to Southern California. During an intensive pedestrian survey and site inventory of the project area, no elements of the resource were identified within the APE, and under alternative 2, the proposed changes to the road south of Kelso would not have any adverse effects to the setting or feeling of this resource.

Old Mojave Trail

Under alternative 2, the proposed roadway rehabilitation and improvements in the project area would not constitute an adverse effect to the Old Mojave Trail (P-36-003033/CA-SBR-3033H). The Old Mojave Trail is listed in the National Register; however, documentation notes that the portion of the trail between Kelso-Cima Road and the UPRR lacks integrity (Tinsley Becker 2021). During an intensive pedestrian survey and site inventory of the project area, no evidence of the historic trail was observed within the APE, likely due to previous disturbances caused by the construction of Kelso-Cima Road. The proposed roadway rehabilitation and improvements would be limited to the existing roadway prism and would not affect any intact elements of the trail.

Archeological Resources

Cima Railroad Hamlet

Under alternative 2, the proposed roadway rehabilitation and improvements in the project area would not constitute an adverse effect to the Cima Railroad Hamlet. During the 2024 survey of the APE, archeologists observed poor conditions when visiting the location in the northern third of the Cima/Kelso-Cima intersection (Area A), and adjacent parts of the site have deteriorated since the previous survey. The previously documented structures were dilapidated or collapsed, and recent refuse was scattered throughout the vicinity. However, alternative 2 could affect the site due to the proposed intersection realignment. Under alternative 2, the intersection would be moved toward the railroad wye, and the existing at-grade crossing of the wye would be relocated. This change would not alter the alignment or function of the wye and its relation to other parts of the site. Although the intersection would be moved away from the previously documented limits of Area A (thus minimizing effects to that portion of the site), construction could disturb other site components, if present. As a result, the remains of the historic property would be designated a high-sensitivity area during construction, and additional monitoring would be required to mitigate any inadvertent adverse effects to the property. Therefore, alternative 2 would not adversely affect the Cima Railroad Hamlet.

Former Corral Area

Under alternative 2, the proposed improvements would not adversely affect the former corral area. The resource was identified in 2015 during construction of employee housing at Kelso. The land was privately owned prior to NPS acquisition in 2004, and the corral was used to raise animals. These features were not

evaluated for National Register eligibility in 2015, but rather avoided completely by construction (NPS 2015c).

The corral features are in an area proposed for potential use as a temporary nursery location within the Preserve to support the project's revegetation efforts. If used for this purpose, raised nursery beds would be constructed on top of the ground surface, and support stakes (approximately one to three stakes) would be pounded into the ground adjacent to the long axis of each bed to support its borders. Shallow trenching would be required to run water lines from this area south to the existing water tanks on the parcel for irrigation. The area surrounding the corral was disturbed during the housing construction, which included installation of a leach field for the septic system, and the water tank and associated water and sewer lines. While the corral area may be used to temporarily house nursery beds, this use would not require removal or alteration of any of the extant corral structures, and ground disturbance would be limited to the nursery bed support stakes and shallow trenching in previously disturbed areas. If this location were pursued for use as the temporary nursery area, a stipulation prohibiting removal or alteration of any extant corral features would be included in contract documents to avoid any inadvertent adverse effects.

Reasonably Foreseeable Impacts

Past, ongoing, and reasonably foreseeable actions include the reconstruction of road segments to improve safety, the rehabilitation of Cima Road, the pavement pulverization on Morning Star Mine Road, routine maintenance and emergency repairs at the Preserve, and widespread safety improvements along roads in the Preserve. Most past, ongoing, and reasonably foreseeable actions generally involve preserving, repairing, and maintaining historic properties. However, because the roads within the Preserve are contributors to multiple historic districts, the reasonably foreseeable impact of these changes on the historic districts in the Preserve could result in additions and changes to National Register-eligible properties.

Under alternative 1, no improvements would be made to the roadways within the project area. The existing roadway would be maintained in place, and impacts would be limited to the normal deterioration from unprecedented weather events. When combined with the effects of past, ongoing, and reasonably foreseeable actions, alternative 1 would not result in direct, short-term, adverse reasonably foreseeable impacts to cultural resources at the Preserve, although damage because of unmitigated erosion, sedimentation, and flooding could result in long-term, adverse impacts.

Under alternative 2, the existing roadway would be rehabilitated, and improvements would be made to Kelso-Cima and South Kelbaker Roads for safety, to protect wildlife and infrastructure, and to enhance visitor experience. The proposed action, along with measures to minimize impacts and mitigate any inadvertent adverse effects, would not alter the characteristics of historic properties in a manner that would diminish their integrity of location, design, setting, materials, workmanship, feeling, or association that qualify them for inclusion in the National Register; therefore, there would be no adverse, reasonably foreseeable impacts to archeological sites, cultural landscapes, or historic structures.

VISITOR USE AND EXPERIENCE

Affected Environment

Visitor Experience

The Preserve provides an opportunity for people from all over the world to experience desert landscapes. Its proximity to major population centers, such as Los Angeles and Las Vegas, combined with major Interstate highways, provide visitors the opportunity for relatively easy access to many parts of the desert. Much of the landscape is open, with broad vistas of undeveloped land. Mountain ranges, such as the New York and Providence Mountains, offer a contrast to the dry hot valleys, attracting many people in the summer with cooler temperatures and forested areas. Volcanic cinder cones; lava flows; rock outcrops;

and unique wildlife, wildflowers, and vegetation are other elements that attract visitors to the Preserve. The sand dune systems, such as Kelso Dunes, are a recreational attraction for hikers to explore. The landscape also offers many other forms of recreation including nature study, rock-climbing, camping, mountain climbing, horseback riding, motorized 4x4 touring, hiking, and hunting and trapping.

In addition to enjoying the scenery of the diverse landscape, there are many cultural sites for visitors to appreciate, such as Soda Springs, the Mojave Road, and numerous abandoned mining districts. Historic structures, HDs, and historic landscapes specific to the project area are discussed in more detail under "Cultural Resources, Historic Structures, Districts, and Landscapes." Kelbaker Road and Kelso-Cima Road provide access to the historic Kelso Depot visitor center that offers historical and interpretive information to visitors about the Preserve. Early miners and ranchers developed roads that today offer visitors a chance to drive into many remote locations where informal camping has traditionally occurred.

In 2023, visitation reached 1.1 million visitors, which is an increase from the 773,463 visitors in 2022 (NPS 2024b). Since 2017, visitation has generally been between 700,000 and 860,000 visitors annually (NPS 2024b). Because of high summertime temperatures, most visitation to the Preserve occurs during winter and spring (NPS 2024c). The majority of visitors are from California (63%), Nevada (14%), and Utah (3%) (NPS 2004). Many residents of adjacent communities such as Needles, Laughlin, and Bullhead City visit the higher elevations in the Preserve during the summer to escape the heat and enjoy a change of scenery (NPS 2000b). Specifically, most visitation occurs on weekends when residents of surrounding areas arrive (i.e., California, Nevada). Traffic counters and field observations indicate that many people use the roads in the Preserve as a route between Las Vegas and Twentynine Palms, with South Kelbaker Road and Kelso-Cima among the busiest roads. This route shortens the drive from approximately four hours (260 miles) to three hours (190 miles) and does not require motorists to travel west on I-40 to access I-15 north.

According to visitor use surveys, 26% of visitors stated their primary reason for visiting the Preserve, or a specific site within the Preserve, was for business purposes (NPS 2004). Frequently, visitors visited the Preserve as part of plans to visit other destinations on their trip, such as Las Vegas, Joshua Tree National Park, and Primm/Stateline, Nevada. The majority of visitors (70%) spend between 1 to 3 hours in the Preserve (NPS 2004). Of those who visited the Preserve, the most common activities included sightseeing, driving paved roads, driving unpaved roads, day hiking, and nature studies. Among the Preserve's features and qualities, visitors rated scenic vistas, the desert experience, and solitude as the most important (NPS 2004).

Visitor Safety

The services and facilities most used by visitors include paved roads, directional road signs in the Preserve, restrooms, and unpaved roads. The road network in the Preserve is important to visitors and the staff responsible for operating and maintaining facilities and by members of the public passing through. Visitors reported that the quality of paved roads, as well as safety features, are extremely important (NPS 2004). Kelso-Cima Road and South Kelbaker Road provide access to the Preserve's other major traffic arteries and connects I-40 and I-15 via multiple route options. In 2023, 252,172 vehicles traveled on Kelbaker Road in the southbound direction (NPS 2024d). However, visitors who travel the roadways currently experience deteriorated road conditions, narrow travel lanes, steep dips and curves, soft and sandy shoulders, poor sight distance, and poorly marked intersections. Visitors also pull off the road or stop in areas that were not designed or constructed for parking, which may impede traffic and create unsafe conditions. As vehicles move from the gravel shoulder back onto the paved roadway, gravel is pulled onto the road, creating a hazard for vehicles, especially motorcycles. Few turnouts or parking areas are available along the roadway to allow slower-moving traffic to turn out or for visitors to stop and view the scenery. Sight distances are poor at several intersections and at sharp curves and elevation changes. Drainage control issues result in periodic flooding and maintenance issues. Because of these unsafe

conditions, visitors must pay close attention to the road surface, which could detract from the visitor experience of the Preserve.

The road system is heavily traveled with average daily traffic counts ranging from 400 to more than 1,700, with speeds limits up to 55 mph. Because of the open desert terrain and long straight roadway alignments, some visitors travel above the speed limits. Excessive speed, improperly banked curves, and drivers losing control of their vehicles when they drop onto the shoulders or underestimate their speeds for a given curve are all causes of vehicle accidents. Visitors can also be rear-ended at intersections where sight distances are poor. Accident rates are high, with an average accident rate of 31.2 fatal accidents per million vehicle miles traveled (UC Berkeley 2024). These conditions have the potential to adversely impact the safety of visitors.

Trends and Planned Actions

The Preserve experienced a sharp increase in visitation from 773,463 visitors in 2022 to 1,178,998 in 2023 (NPS 2024b). Data show that recreational use of the Preserve is trending upward. Specifically, daytime recreation use, overnight visitation, and vehicle traffic in the Preserve is expected to increase with the growth of nearby cities such as Las Vegas and Bullhead City, Arizona, and Baker, California. An increase in visitation and traffic is anticipated to continue in future years, based on 2023 statistics for vehicles entering the Preserve (NPS 2024d).

Primary threats to the scenic views and landscapes of the Preserve include proliferation of invasive plants and dust (NPS 2013). Dust may be carried from as far away as the San Joaquin Valley and Los Angeles basin, although nearby sources of dust such as the National Training Center at Fort Irwin, local mines and generating stations, vehicle traffic from I-15 and I-40, and off-road vehicle use within the Preserve also contribute to air pollution (NPS 2002a). Overhead flights and passing freight trains may occasionally interrupt the natural soundscapes of the Preserve, but vehicle traffic generally does not produce a noticeable impact on the natural sounds in the Preserve (NPS 2013).

Unprecedented weather events are anticipated to affect visitor use patterns throughout the national park system, including when, where, and how visitors recreate (Fisichelli et al. 2015). Historically throughout the national park system, higher visitation was related to warmer temperatures, except at the very warm end of the temperature spectrum (>77°F) where visitation numbers dropped off rapidly. Shifts in climatic conditions, such as temperature increases beyond the historical range, are occurring in California (NPS n.d.). Heat waves in California are expected to increase in frequency, with individual heat waves also showing a tendency toward becoming longer and extending over a larger area (NPS n.d.). During warmer months, visitors could experience more heat exposure than they were expecting, which would have implications for visitor safety. Many outdoor recreation activities rely on favorable weather conditions; therefore, unprecedented weather events have the potential to drive changes in visitation patterns. Extremely high temperatures during summer could change tourism seasonality. In addition, increased temperatures and the potential for a change in the frequency of precipitation, wildfire, and flood events could alter wildlife habitat (i.e., desert tortoise). This could impact opportunities for wildlife viewing in the Preserve, which would adversely affect visitor experience.

Past, ongoing, and reasonably foreseeable future actions with the potential to affect visitor use and experience and visitor safety include past roadway improvement projects and ongoing road maintenance activities. These activities include rehabilitation and reconstruction of roadways, pothole repair, shoulder grading, shoulder edge repair, and the development of recreation resources (e.g., kiosks, trailheads, and waysides). Future activities would also likely include rehabilitation and reconstruction of other roadways within the Preserve. These actions could affect visitor use and experience, as well as visitor safety, by displacing visitors during high seasonal use periods, and increasing visitor exposure to hazardous conditions related to deteriorated roadways. These actions would temporarily degrade visitor access and experiences during construction phases (e.g., closures of parking areas or traffic lanes), but once complete, they would promote visitor access, safety, and quality experiences at these areas.

Environmental Consequences

Alternative 1: No-Action Alternative

Under the no-action alternative, management practices and conditions of Kelso-Cima and South Kelbaker Roads would continue, and the existing visitor use and experience would remain primarily unchanged. Visitors would continue to experience deteriorated road conditions and a lack of areas to safely pull over to experience scenic vistas, view wildlife, and take photographs.

No tortoise exclusion fencing would be installed, meaning that vehicle strikes on desert tortoises and other wildlife would continue at their existing rate. Visitors would continue to encounter wildlife that have been killed by vehicle strikes, adversely impacting their experience. Continued deterioration of the roads may lead to increased maintenance needs over time, resulting in increased frequency of noise and visual disturbances along with potential roadway closures during the duration of the maintenance activities. These impacts would be short term, but recurring, and could interrupt visitor use and experience.

Existing safety concerns for visitors on Kelso-Cima and South Kelbaker Roads would also continue. Travel lanes and inconsistent shoulder widths would continue to be inadequate for large vehicles and trailers that use the road, leading to persistent road shoulder deterioration and vehicle wheel drop-offs from the pavement edge, resulting in long-term, adverse impacts on visitor safety. The roadways would continue to include locations with dangerous geometric deficiencies, sharp curves, abrupt grade changes, and poor sight lines and distances—all of which would contribute to higher risks of vehicle collisions, injuries, and fatalities. No tortoise exclusion fencing would be installed, and vehicle strikes on desert tortoises and other wildlife would continue, negatively impacting visitor safety. Overall, the no-action alternative would have both short- and long-term, adverse impacts on visitor use, experience, and safety.

Alternative 2: Proposed Action

Visitor Experience

Under alternative 2, roadway improvements, such as paving with asphalt, restriping pavement, adjusting the profile of the roadway, and installing low-water crossing features would create a more pleasant driving experience for visitors, resulting in long-term, beneficial impacts on visitor experience. In the long term, improvements to the roadway would reduce the amount of ongoing maintenance needed compared to existing conditions, leading to fewer delays and detours for visitors.

The installation of speed limit and other signs (e.g., “Do Not Enter When Flooded,” “Flash Flood Area,” speed feedback, soft shoulder, winding road, curve ahead, and wildlife awareness signage) would change the existing viewsheds on the roads. These additions would have long-term, adverse impacts on visitor experience by creating more interruptions in scenic vistas along the roads. However, visitors might benefit from additional road condition and safety warning signs, which would result in a long-term, beneficial impact on visitor experience.

Adding approximately 37 pullouts along the project area would provide additional opportunities for visitors to enjoy the scenic vistas and take photographs, resulting in long-term, beneficial impacts on visitor experience. The pullout proposed near the Kelso Dunes viewpoint would provide visitors the opportunity to safely view and appreciate the Kelso Dunes from the roadway. Improvements to the existing parking area at Granite Pass would also have long-term, beneficial effects on visitor experience. Repaving the parking area, installing a concrete pad for future restroom facilities, and adding signage would improve visitor access to recreational opportunities in the area. Additionally, the creation of a new welcome area with parking and the relocated monument entrance sign closer to I-40 on South Kelbaker Road would result in long-term, beneficial and adverse impacts on visitor experience. Some visitors may appreciate the extra space to park and the clarity of the relocated monument entrance sign, while other visitors may find that the new welcome area negatively alters the natural viewshed.

Short-term, adverse impacts on visitor use and experience would occur during construction of the project, which is anticipated to take approximately three years to complete. During construction, roadway closures and detours would alter visitor experience by increasing travel times and potentially limiting access to certain areas of the Preserve during some phases of construction. Access to hiking, wildlife watching from the road, and other recreational opportunities would be more limited during construction. Specific areas with more limited access during construction would include the Kelso Dunes and the Granite Pass area. The NPS would complete the project in phases to ensure visitor access is maintained to critical Preserve amenities and destinations to the extent possible; however, it would likely take some visitors longer to access destinations in the Preserve during certain phases of construction due to slower travel times.

Construction activities resulting in the removal of existing vegetation would alter current natural viewsheds, resulting in short-term, adverse impacts on visitor experience. Following construction, revegetation would occur to reconstruct the natural spacing, abundance, and diversity of native plant species, which would restore the viewshed for visitors.

Additionally, there would be a higher volume of construction vehicle traffic to and from staging areas and the project area to move construction materials. The higher volume of vehicles may lead to occasional delays for visitors driving on roadways between the project area and the staging areas. The use of staging areas during construction would also alter the existing viewshed, interrupting scenic vistas along the road. However, staging areas would be on previously disturbed land to minimize adverse impacts on viewsheds. The NPS would restore staging areas to their previous condition or better after construction, where feasible. Overall, the use of staging areas would result in short-term, adverse impacts on visitor experience, which would be minimized by using previously disturbed areas.

To alleviate adverse impacts to visitor experience during construction, visitors would be informed in advance of construction activities via the Preserve's website, signs, and at the visitor center. If recreational opportunities were inaccessible or less accessible during some phases of construction, Preserve staff would provide suggestions for alternative recreational options for visitors. Preserve staff would also be available to address visitor questions during construction and would provide regular updates to the public about the project's progress.

Visitor Safety

Under alternative 2, the rehabilitation and improvements to Kelso-Cima and South Kelbaker Roads would have long-term, beneficial impacts on visitor safety. Adjustments to the vertical and horizontal profile of the roadway and improvements to the roadway surface would create a smoother driving experience with fewer sharp curves, abrupt grade changes, and poor sight lines and distances. The installation of speed limit and other traffic signs, radar speed feedback signs, additional signage, and roadway striping and markings would increase clarity and awareness for drivers, resulting in safer conditions and improved access. Reduced speed limits, which would be determined during final design, would also improve visitor safety. Improving and stabilizing existing low-water crossings would allow drivers to maintain more consistent speeds and reduce the potential for roadway damage during heavy rain events.

The proposed road realignment at Cima Junction would also have long-term, beneficial impacts on visitor safety. Realigning Kelso-Cima Road to form a gradual horizontal curve would provide safer driving conditions for through-traffic at the posted speed limit. Eliminating the existing "T" intersection at Cima Road would also reduce the risk of rear-end collisions.

The addition of approximately 37 pullouts along the project corridor would have long-term, beneficial impacts on visitor safety by providing space for drivers to pull over. The pullouts would allow visitors to pull off to view the landscape, rest, or make unplanned emergency stops without parking on the shoulder of the road, and pullouts would also allow law enforcement officers to pull drivers over during traffic stops.

Installation of desert tortoise exclusion fencing and recessed vertical barriers would reduce the presence of wildlife on the roadways, leading to fewer collisions between motorists and animals, resulting in long-term, beneficial impacts to visitor safety. Additional long-term, beneficial impacts would result from the installation of tortoise crossing features. These features would include a grate structure that would facilitate movement for tortoises and small wildlife, while also providing an at-grade structure for vehicles, bicycles, and pedestrians to safely cross the road surface.

Repaving the Granite Pass parking area, adjusting the access point to improve sight distance, installing pavement markings, and adding signage to the parking area would also improve visitor safety by clarifying traffic patterns and improving ingress and egress in the area. Additionally, the creation of a new welcome area with parking and the relocated entrance sign, closer to I-40 on South Kelbaker Road, would result in long-term, beneficial impacts on visitor safety. The welcome area parking would provide an additional area for drivers to stop for rest, to view the landscape, or to make unplanned emergency stops without pulling over onto the shoulder of the road. To help alleviate adverse impacts to visitor safety during construction, the Preserve would establish procedures for emergency vehicle access through construction zones.

Reasonably Foreseeable Impacts

Past, ongoing, and reasonably foreseeable actions that would affect visitor use and experience include the reconstruction of road segments to improve safety, the Cima Road rehabilitation, pavement pulverization on Morning Star Mine Road, routine maintenance and emergency repairs at the Preserve, and other road safety improvements (see Table 1) at the Preserve. These past, ongoing, and reasonably foreseeable actions would result in or have resulted in long-term, beneficial impacts on visitor experience and safety, with short-term, adverse impacts on visitor experience during construction periods.

Under alternative 1, the continuation of current management practices and existing conditions on Kelso-Cima and South Kelbaker Roads would have short- and long-term, adverse impacts on visitor use, experience, and safety from the continued deterioration of road conditions and the existing safety concerns. When combined with the effects of past, ongoing, and reasonably foreseeable actions, alternative 1 would contribute a slight adverse increment to the overall reasonably foreseeable impacts on visitor use, experience, and safety.

Under alternative 2, the rehabilitation and safety improvements on Kelso-Cima Road and South Kelbaker Road would have long-term, beneficial impacts on visitor experience and safety by improving the driving experience, enhancing access to recreational opportunities at the Preserve, and addressing safety concerns. There would be long-term, adverse impacts from the installation of signage, which would alter existing scenic vistas for visitors. During construction, impacts on visitor experience would be short term and adverse from altered traffic patterns and detours during phased road closures. When combined with the effects of past, ongoing, and reasonably foreseeable actions, alternative 2 would contribute long-term, beneficial impacts on visitor use, experience, and safety and would contribute to the overall reasonably foreseeable impacts in the project area.

WATER RESOURCES

Affected Environment

Floodplains

The project area is located within known floodplains, particularly within and adjacent to the approximately 150 ephemeral stream channels that intersect or flow parallel to the project area (HDR 2024). Executive Order 11988, “Floodplain Management,” requires the NPS and other federal agencies to evaluate the likely impacts of actions in floodplains. The objectives of the executive order are to (1) avoid, to the extent possible, long- and short-term, adverse impacts associated with occupancy,

modification, or destruction of floodplains; and (2) avoid indirect support of development and new construction in such areas wherever there is a practicable alternative. The NPS administers floodplain policy through Director's Order #77-2: *Floodplain Management* and Procedural Manual #77-2: *Floodplain Management* (NPS 2002b, 2003). NPS *Management Policies 20*06 and Director's Order #77-2 also encourage floodplain preservation, minimization of impacts, and adherence to federal floodplain management law (NPS 2006, 2003). The NPS policy is to preserve floodplain functions and values and minimize potentially hazardous conditions associated with flooding, including threats to human health/life, risk to capital (NPS) investment, and impacts on natural and beneficial floodplain values. The floodplains in the project area are described further in the draft Floodplain Statement of Findings (FSOF) provided in appendix D.

Per the FFRMS, the NPS is implementing the 0.2-percent-annual-chance Flood Approach (0.2PFA), also known as the 500-year floodplain, to establish the FFRMS regulatory floodplain elevation. Federal Emergency Management Agency (FEMA) National Flood Hazard Layer data designate the proposed project area as "Not Printed," and the entire proposed project area is mapped as FEMA Zone D – Area of Undetermined Flood Hazard (FEMA n.d.). Due to the lack of available FEMA data for the proposed action area, the 100-year and 500-year floodplains were delineated by generating a FLO-2D hydrologic model using publicly available data to simulate various 100-year and 500-year storm events within the hydrologic catchment area that contributes surface flows to the project area.

The 100-year and 500-year delineated floodplains primarily overlap with the various ephemeral stream channels and wash systems that intersect the project area. The 100-year floodplain encompasses approximately 61 acres within the project area, and the 500-year floodplain encompasses approximately 102 acres within the project area. Flood depths and velocities are variable, and the locations of greatest flood depth and velocity are primarily associated with the prominent wash crossings, particularly at Cedar Wash, Winston Wash, Van Winkle Wash, and Kelso Wash (the primary receiving water within the project area) (Figures 8 and 9).

Flooding within the project area typically occurs following substantial amounts of localized rainfall. The floodplains in their natural or relatively undisturbed state support various water resource values, climate-regulating values, biological resource values, and cultural resource values (FEMA 2015). The drainages and floodplains provide connectivity within the drainage basin, linking tributaries and various ephemeral drainage segments, thereby facilitating the movement of water, sediment, nutrients, and plant seeds and propagules. Other floodplain processes include dissipation of energy and movement of sediment and debris. The floodplains reduce flow velocities and allow surface waters to deposit sediment. Runoff is also slowed by vegetation in the floodplains that reduces potential erosion hazards and further promotes sediment deposition, which may add nutrients to the floodplain.

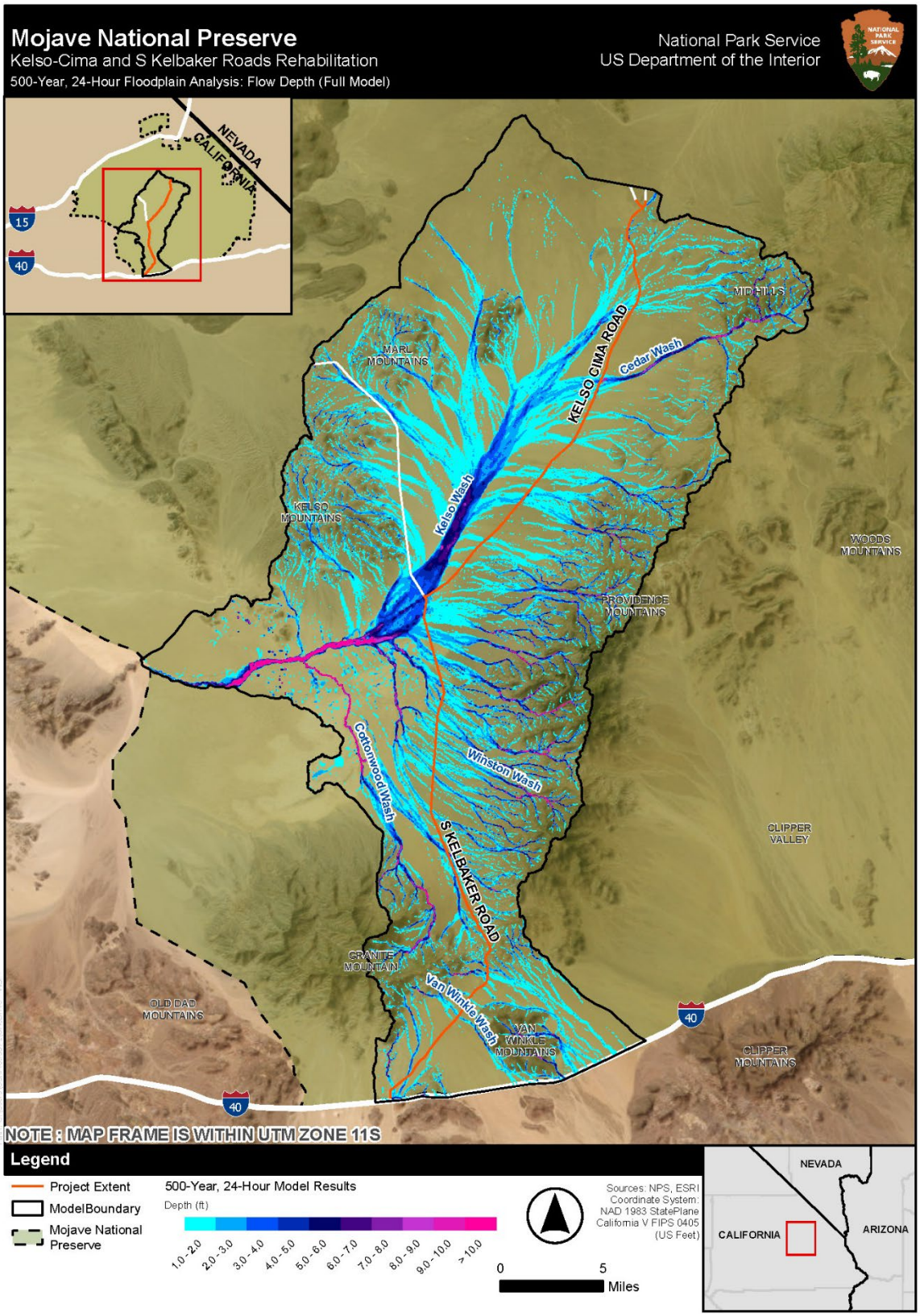

FIGURE 8. 500-YEAR, 24-HOUR STORM FLOW DEPTHS

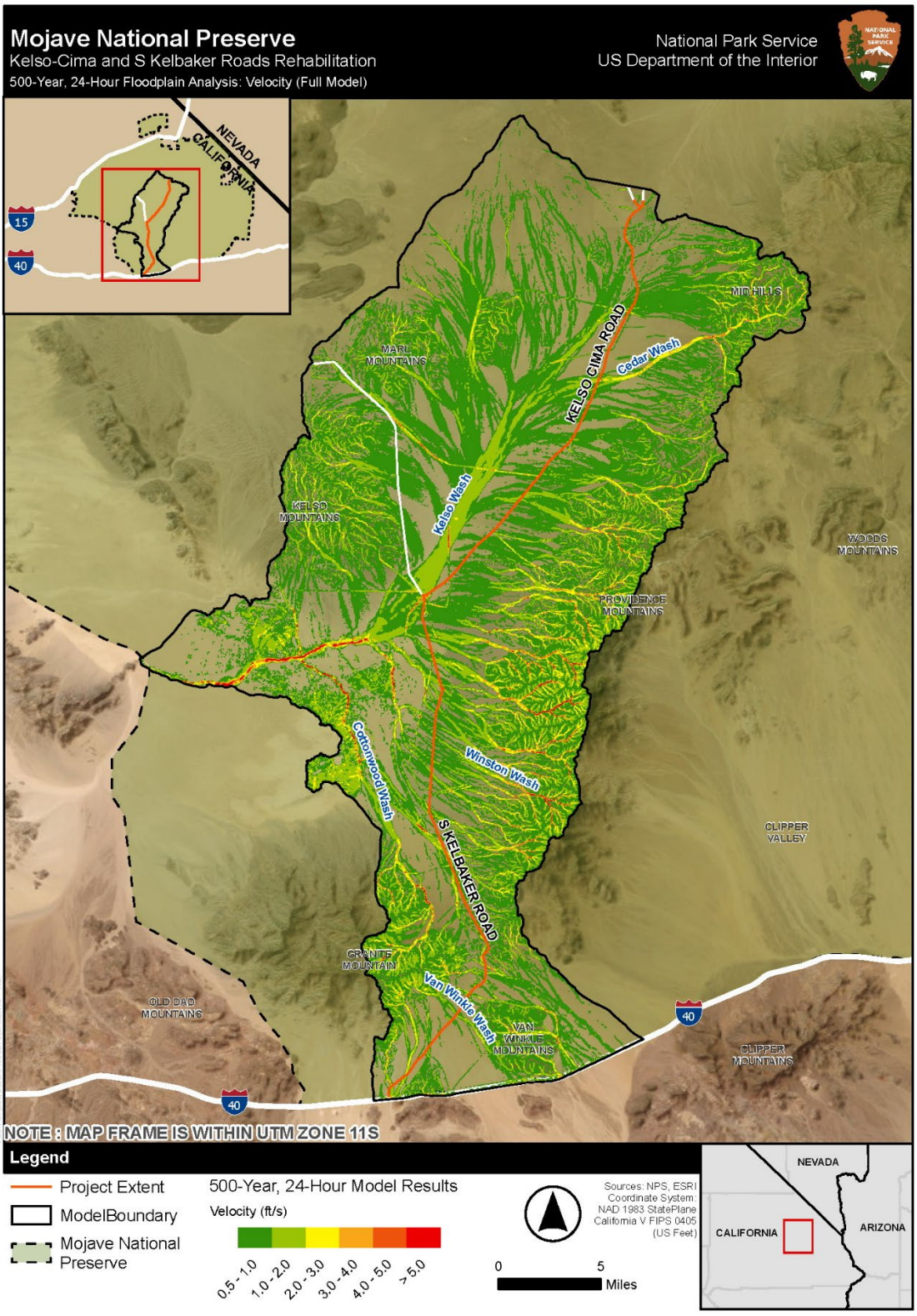

FIGURE 9. 500-YEAR, 24-HOUR STORM FLOW VELOCITIES

Surface Water

Except for occasional flood flows, surface water in the Preserve is limited to short stretches of flowing water below springs, seeps, pools, or excavated ponds that intercept groundwater. Most of the project area is located within the Mojave Subbasin, and flows within the project area drain into Kelso Wash, which terminates at Soda Lake. Soda Lake is a confined, closed basin, and precipitation falling in the project area does not drain to a relatively permanent or traditional navigable water; instead, precipitation and surface flows within the project area either evaporate, infiltrate the substrate, or flow into alkali flats. Within the project area there are approximately 150 ephemeral stream channels that only flow in direct response to precipitation runoff (HDR 2024).

The ephemeral stream channels in the project area are classified as unvegetated wetlands, as defined by NPS policy (NPS 2016b), with streambeds consisting of unconsolidated cobble-gravel and sand. Work in wetlands requires compliance with NPS Director's Order #77-1: *Protection of Wetlands*; however, certain types of activities are excepted from the requirements to prepare a Wetland Statement of Findings and wetland compensation requirements. Pursuant to NPS Procedural Manual #77-1, section 4.2.1.7, activities that would collectively affect less than 0.1 acre of NPS-defined wetlands that are associated with maintenance, repair, or renovation (but not full reconstruction or expansion) of currently serviceable facilities or structures are excepted from the requirements of Wetland Statement of Findings preparation and wetland compensation requirements (NPS 2016b).

The Clean Water Act establishes permit programs to control discharges into waters of the US (WOTUS) and provides the US Environmental Protection Agency (USEPA) and the US Army Corps of Engineers (USACE) with regulatory authority to issue permits. For purposes of issuing permits, USEPA and USACE have defined WOTUS and verify jurisdiction of aquatic resources that meet that definition, either through the permitting process or a separate jurisdictional determination process. The current working definition of WOTUS, also known as the conforming rule, can be found in the *Federal Register* (88 Fed. Reg. 61,968, September 8, 2023). Pursuant to the current working definition of WOTUS, the ephemeral stream channels in the project area are not likely WOTUS subject to Clean Water Act permitting requirements; however, USEPA, USACE, and/or the state of California are responsible for making all final jurisdictional determinations. Prior to construction, the NPS and FHWA would acquire any necessary permits from USEPA, USACE, and/or the Regional Water Quality Control Boards.

Groundwater

Groundwater is found underneath most of the project area and Preserve, located within deep alluvial basins that contain centuries-old aquifers, and within smaller, localized, perched aquifers that have limited groundwater storage. Groundwater basins in the Preserve are recharged from surface and subsurface infiltration, primarily as a result of precipitation seeping into bedrock fractures or running off and infiltrating alluvium along the edges of mountains or through alluvial fans and arroyo channels (Izbicki et al. 1995). Valleys within the Preserve have limited surface recharge due to low-permeability geologic layers and deep vadose zones.[3] Greater precipitation and recharge occur at higher elevations along the upper edges of the drainage basins in the Preserve; however, additional recharge comes from infiltration of infrequent runoff at lower elevations and subsurface connections between basins (NPS 1999).

Groundwater withdrawal and discharge in the Preserve occur through desert springs, seeps, wells, and subsurface flow into adjacent groundwater features, and a few ephemeral streams. Some of the deep aquifers are associated with perennial springs that support small riparian ecosystems. The more common

[3] The vadose zone is the Earth's terrestrial subsurface that extends from the surface to the regional groundwater table. It may be very shallow or very deep, depending on the depth to the water table (Holden and Fierer 2005).

types of springs or seeps are those located along the slopes and edges of mountain ranges fed by the smaller localized aquifers. More than 200 springs and seeps have been identified in the Preserve (King and Casebier 1981). Small springs and seeps in the Preserve offer isolated and limited water for plants, wildlife, or domestic or commercial purposes. Some springs produce potable water, but overall water quality is poor because of high dissolved mineral concentrations (BLM 1996).

Within the Preserve, water wells have been drilled into the groundwater aquifers, primarily for domestic use and livestock needs, but some wells have also been drilled for mining use. The Preserve protects deep groundwater resources and the surface water features that rely on them through long-term monitoring and active engagement in regional processes and proposals that may affect those resources.

The project area contains no groundwater-fed wetlands, springs, seeps, ephemeral streams, or other water resources. All water resources within the project area are solely fed by surface runoff from localized precipitation events.

Trends and Planned Actions

Floodplains

The Preserve is susceptible to flooding during large storm events. Destructive floods have occurred periodically, particularly during the late-summer monsoon season. High-volume storm flows often deposit sand and gravel on the road surfaces, requiring post-storm removal by Preserve maintenance crews. Larger flood events have also washed out portions of roads within the Preserve, stranding visitors and residents between road segments and requiring road closures and significant repairs (NPS 2023).

Due to unprecedented weather events, the Mojave Desert, like many deserts in the world, is becoming hotter and drier. Over the last century, the Mojave Desert has warmed by approximately 3.6°F, and rainfall has declined by 20% in some locations (Waters 2021). In the Newberry Mountains on the southeastern side of the Mojave Desert, recent studies have observed a 2.6°F increase in the average minimum temperature and a decrease of 1.18 inches in average precipitation over the last 30 years (1979–2008) (Guida 2011). California's 2009 California Climate Adaptation Strategies report, as referenced in the Mojave National Preserve Action Plan, predicts increases in temperature of 2 to 5°F and a 12 to 35% overall decrease in precipitation by 2050 (CNRA 2009).

Additionally, as unprecedented weather events continue to affect sea level rise worldwide, extreme weather is becoming more prevalent. In late 2022 and early 2023, California experienced deadly flash floods during powerful wintertime atmospheric rivers (i.e., long, narrow regions in the atmosphere that transport water vapor), which may become more powerful as unprecedented weather events increase the amount of moisture they can carry (NRDC 2023). The 2022 and 2023 storms washed out portions of Preserve roads; covered roads with rocks, sand, and debris; and stranded visitors until temporary repairs could be made (NPS 2023). As a result of less overall precipitation, the parched soils within the Preserve are more prone to repel water, and flash floods can become more devastating. The rapid runoff rate also erodes soils, adding sediment and debris to surface water, and provides a greater threat to human health and the environment (Yin et al. 2023).

Past actions at the Preserve include the reconstruction of road segments to improve safety, Cima Road rehabilitation, and previous routine maintenance and emergency repairs in the Preserve. The reconstruction of road segments included the installation of roadway embankment protection in areas where flood events have frequently caused damage, and reinforcement of two low-water crossings to reduce the severity and incidence of washouts. The Cima Road rehabilitation action included providing additional low-water crossings and individual location improvements to Kelbaker Road, including low-water crossings and pavement rehabilitation. Previous emergency repair projects, which occurred as a result of flooding caused by monsoonal rains during July 2022, included repairs to two major washouts on North Kelbaker Road that required increased armoring and construction of water-diversion elements. These actions have short-term, adverse impacts on floodplains during construction due to surface

disturbance and vegetation removal. The surface disturbance and loss of vegetation may cause surface compaction that could reduce the potential for flood energy dissipation and cause a loss of shallow groundwater recharge and sediment and nutrient capture. In turn, the short-term impacts could result in more rapid and energetic runoff responses and temporarily make construction areas more vulnerable to erosion. The long-term impacts to floodplains from these actions would be beneficial, supporting overall floodplain stability and connectivity by stabilizing existing stream channels and surface water conveyance infrastructure to reduce potential erosion and road infrastructure damage, which in turn reduce potential safety hazards to the public during and immediately after flood events.

Future actions at the Preserve include pavement removal on Morning Star Mine Road and routine maintenance and emergency repairs in the Preserve. The pavement removal on Morning Star Mine Road would be located outside known floodplains, and no impacts on water resources are anticipated. Conducting routine maintenance and emergency repairs would improve public safety and the resilience of the roads. The rehabilitation would include improvements and installation of low-water crossings within floodplains. Similar to the past and present actions described above, these improvements would have short-term, adverse impacts to floodplains from surface disturbance and vegetation removal during construction. The short-term, adverse impacts could temporarily reduce floodplain energy dissipation capabilities, reduce shallow groundwater recharge, and reduce sediment and nutrient capture, resulting in more rapid and energetic runoff responses and areas more vulnerable to erosion. Similar to the past and present actions, the long-term impacts to floodplains would be beneficial, supporting floodplain stability and connectivity, and reducing potential erosion, damage to infrastructure, and safety hazards to the public.

Surface Water

In the southwestern US deserts, precipitation events (e.g., intense rain and associated flooding) are expected to be more extreme and occur roughly twice as often as they have historically occurred (Kharin et al. 2007). As discussed above, unprecedented weather events continue to affect sea levels worldwide, with extreme weather becoming more prevalent. Powerful wintertime atmospheric rivers may become more powerful as unprecedented weather events increase the amount of precipitation they can carry, creating more devastating storms and flood events within the Preserve. Parched soils prone to repel water may result in flash flooding with greater impacts to the surface waters in the Preserve (Yin et al. 2023).

Past and present actions in the Preserve, as described above, included installation of roadway embankment protection in areas where flood events have frequently caused damage, and reinforcement and installation of low-water crossings to reduce the severity and incidence of washouts. Short-term, adverse impacts from these actions include surface disturbance within ephemeral streams that temporarily increase erosion potential and stream channel stability and temporarily impede the flow of water. The long-term impacts benefit surface water features because these actions ultimately increase stream stabilization, increase upstream and downstream connectivity, and reduce potential erosion and damage to streambanks and Preserve infrastructure during flooding events.

Future actions at the Preserve include pavement removal on Morning Star Mine Road and routine maintenance and emergency repairs in the Preserve. The pavement removal on Morning Star Mine Road would occur outside known surface waters, and no impacts on water resources are anticipated. Future routine maintenance and emergency repairs in the Preserve would improve public safety and the resilience of the roads. Similar to the past and present actions described above, these improvements would have short-term, adverse impacts on surface waters from surface disturbance and vegetation removal within ephemeral stream beds during construction. The short-term impacts would temporarily increase erosion potential and stream stability and temporarily impede the flow of water. The long-term impacts would be beneficial to surface water features because these actions would ultimately increase stream stabilization, increase upstream and downstream connectivity, and reduce potential erosion and damage to streambanks and Preserve infrastructure during flooding events.

Groundwater

Varying weather conditions in the southwestern deserts, including increased temperatures, reduced precipitation, lower snowpack, and increased evapotranspiration, are likely to result in changes to the hydrologic cycle and water sources for both human use and ecosystem function. In desert systems like those found in the Preserve, this would likely result in reduced infiltration of precipitation into perched aquifers that are the source for many of the seeps, springs, and developed water features outside the project area. Reduced recharge to deep alluvial aquifers would limit groundwater availability for water supply, though the effects may take centuries (Hughson et al. 2011).

Past and present actions as described above, include installation of roadway embankment protection in areas where flood events have frequently caused damage, and reinforcement and installation of low-water crossings to reduce the severity and incidence of washouts. These actions have short-term, adverse impacts on groundwater during construction because the surface disturbance and loss of vegetation may compact surfaces, which could reduce shallow groundwater recharge. The long-term impacts to groundwater are negligible because recharge capabilities are returned preexisting conditions.

Future actions at the Preserve include pavement removal on Morning Star Mine Road and routine maintenance and emergency repairs in the Preserve. The pavement removal on Morning Star Mine Road would have no impacts on groundwater. Routine maintenance and emergency repairs in the Preserve would improve public safety and the resilience of the roads. Similar to the past and present actions described above, these improvements would have short-term, adverse impacts on groundwater from surface disturbance and vegetation removal during construction. The short-term, adverse impacts could temporarily reduce shallow groundwater recharge. Similar to the past and present actions, the long-term impacts to groundwater would be insignificant because recharge capabilities would be returned to preexisting conditions.

Environmental Consequences

Alternative 1: No-Action Alternative

Under the no-action alternative, no changes or improvements to the Kelso-Cima and South Kelbaker Roads would occur. The existing use and maintenance of the roadways would continue, and the current structural and safety issues would remain. The no-action alternative would not require short-term vegetation and soil disturbance, nor would it require construction equipment to travel within floodplain areas. No improvements or stabilization activities would occur at the existing low-water crossings to enhance cross drainage and reduce the water surface elevation on the roadways during heavy rain events. Road undermining and erosion would continue to occur at floodplain crossings, reducing floodplain functions and values, including flood flow moderation, water quality maintenance, drainage basin connectivity, vegetation establishment, surface and subsurface water retention, and movement of sediment and debris. Therefore, the no-action alternative would result in short- and long-term, adverse impacts to floodplains. The ephemeral stream channels would continue to experience downcutting and erosion near roadways during heavy rain events, contributing to reductions in stream stability and increasing sediment transport downstream. Therefore, the no-action alternative would have long-term, adverse impacts to surface waters.

Groundwater recharge would remain consistent, and groundwater resources would not be affected as a result of the no-action alternative.

Alternative 2: Proposed Action

Floodplains

Under alternative 2, the NPS would rehabilitate and improve safety on the Kelso-Cima and South Kelbaker Roads along approximately 42 miles of roadway. The roadway rehabilitation and safety

improvement project would overlap with approximately 61 acres of the 100-year floodplain and 102 acres of the 500-year floodplain, as modeled in the draft FSOF (NPS 2024e).

Alternative 2 would require vegetation removal, soil disturbance, and vehicle/equipment travel within floodplains to construct and install the roadway improvement features, including low-water crossings, tortoise fencing, recessed vertical barriers, and other crossing structures. The disturbed areas would be reclaimed, where feasible, after construction is complete. Short-term, adverse impacts on floodplains would occur as a result of surface disturbance and vegetation removal. The surface disturbance and loss of vegetation could compact surfaces that could reduce the potential for flood energy dissipation and sediment and nutrient capture. These short-term impacts could result in more rapid and energetic runoff responses and temporarily make the construction areas more vulnerable to erosion. Therefore, alternative 2 would have short-term, adverse impacts on floodplains.

Mitigation measures to reduce short-term impacts on water resources would include revegetating disturbed areas with native plant species that reflect surrounding native vegetation; complying with all relevant Clean Water Act requirements, including management of stormwater-related nonpoint source pollutants including sediment; implementing best management practices for drainage and sediment control; limiting construction or vegetation clearing activities to the greatest extent possible; and avoiding, as practicable, any construction work within water resources during periods of potential surface flow.

The proposed roadway rehabilitation and improvements, particularly the improvement and stabilization of the approximately 106 existing low-water crossings, would result in long-term, beneficial impacts on floodplains. Improving the low-water crossings would reduce road undermining, and riprap bank protection would prevent road damage during flood events. Reducing road undermining and erosion would stabilize the road crossings and the floodplains adjacent to the roadways, improving water resource values (e.g., natural moderation of floods and water quality maintenance), climate-regulating values (e.g., slowing floodwaters, filtering surface water, recharging groundwater, and mitigating impacts of extreme weather events), and living resource values (e.g., wildlife species, plant resources, and wildlife habitat connectivity across the roadways). Additionally, alternative 2 would mitigate current risks to floodplain values, including human health and safety, because the low-water crossings would decrease the likelihood of road degradation and damage and would decrease the probability of drivers becoming stranded on the road between drainage crossings during flow events.

In the event of substantial 100- or 500-year storm events, alternative 2 would reduce the frequency and duration of road closures and potential damage. The additional roadside pullouts would provide safe areas for vehicles and visitors to wait until floodwaters recede. The proposed additional signage would improve hazard communication to visitors. Alternative 2 would enhance cross drainage and reduce surface water elevation across the roadways during heavy rain events. Other floodplain processes and improvements would include reducing flow velocities and improving sediment deposition and nutrient transportation. Alternative 2 would also allow Preserve staff to better manage the roadways and minimize public safety hazards and potential infrastructure damage during flood events. Alternative 2 would have long-term, beneficial impacts on floodplains.

Surface Water

Alternative 2 would require temporary surface disturbance and vegetation removal, which would require vehicle and equipment travel within surface water features (ephemeral stream channels). This temporary disturbance would increase erosion potential, reduce stream stability, and temporarily impede the flow of stormwater or snowmelt during construction activities. Alternative 2 would have short-term, adverse impacts on surface waters.

Alternative 2 would ultimately increase stream stabilization by improving low-water crossings to reduce the severity and incidence of washouts. Alternative 2 would also increase stream stabilization, increase

upstream and downstream connectivity, and reduce potential erosion and damage to streambanks and existing infrastructure during flooding events. Alternative 2 would have long-term, beneficial impacts on surface waters.

Groundwater

As described above, alternative 2 would require temporary surface disturbance associated with the various roadway improvements. The temporary surface disturbance and loss of vegetation could compact surfaces, which could reduce shallow groundwater recharge. Therefore, alternative 2 would have short-term, adverse impacts on groundwater.

Alternative 2 would not result in significant additions of impervious surfaces, and all temporarily disturbed areas would be reclaimed and de-compacted after construction is complete. Groundwater recharge capabilities would be returned to preexisting conditions after construction. Therefore, alternative 2 would not result in long-term, adverse impacts on groundwater.

Reasonably Foreseeable Impacts

Past, ongoing, and reasonably foreseeable actions include the reconstruction of road segments to improve safety within the Preserve and routine and emergency repairs in the Preserve. Past and ongoing actions such as the reconstruction and rehabilitation of road segments within the Preserve have resulted in short-term, adverse impacts on water resources during the construction periods from surface disturbance, vegetation removal, and vehicle and equipment travel. However, these types of actions have ultimately resulted in long-term, beneficial impacts on water resources by stabilizing surface water crossings within floodplains, increasing upstream and downstream connectivity, reducing erosion potential, reducing risks of safety hazards to visitors, and reducing potential damage to existing infrastructure. The past and ongoing actions provide flood resiliency, reduce erosion and flood damage, and promote long-term stability within the Preserve. Similarly, reasonably foreseeable actions, such as routine maintenance and emergency repairs, would also provide long-term benefits to water resources, thus improving the resilience of existing infrastructure during flood events, supporting floodplain and surface water stability and connectivity, reducing potential erosion damage, and reducing safety hazards to the public.

Under alternative 1, the no-action alternative, continued road undermining and erosion would result in long-term, adverse impacts to water resources. Impacts from increasingly deteriorating roadways could affect visitor safety and decrease the number of visitors over time. Roadways could become washed out during major flood events, making travel through the Preserve impassible. These types of flood events could also degrade downstream water quality and watershed health. When combined with the effects of past, ongoing, and reasonably foreseeable actions, the no-action alternative could contribute long-term, adverse reasonably foreseeable impacts to water resources.

Under alternative 2, construction activities would result in short-term, adverse impacts from surface disturbance, vegetation removal, and vehicle and equipment travel within water resources. However, alternative 2 would also result in long-term, beneficial impacts from the improvement of water resource stability, flood flow moderation and resilience, and upstream and downstream connectivity. Alternative 2 would increase the longevity of the road infrastructure, provide a resilient travel route through the Preserve and maintain the water quality and watershed health downstream of the roadways. When combined with the effects of past, ongoing, and reasonably foreseeable actions, alternative 2 would contribute short-term, adverse impacts, as well as long-term, beneficial impacts to water resources and would contribute to the overall reasonably foreseeable impacts within the Preserve.

CHAPTER 4: CONSULTATION AND COORDINATION

INTRODUCTION

This chapter describes the consultation and coordination conducted during the preparation of this environmental assessment (EA). The civic engagement process for the project began in January 2024. A detailed description of the civic engagement/early consultation process and the agency consultation initiated during the development of the EA is summarized below.

PUBLIC PARTICIPATION AND SCOPING

The Civic Engagement Process

Public involvement is an essential component of the NEPA planning process. The NPS released a press release on January 4, 2024, with information about the proposed project, a link to comment on the project, and registration information for the virtual public meeting. The NPS released a project newsletter on January 11, 2024, providing the public with background on the proposed project, the purpose and need for the project, preliminary alternatives, the planning process, and how to comment on the newsletter. The document was published on the NPS Planning, Environment, and Public Comment (PEPC) website at: https://parkplanning.nps.gov/MOJA_KelsoCima.

The civic engagement period was open for 30 days from January 11, 2024, to February 10, 2024. The NPS considered all comments from members of the public and any written comments emailed or mailed to Preserve headquarters, entered the comments into PEPC, and included them in the overall project record.

In general, commenters were concerned about speed limit enforcement, road closures, and construction duration. Commenters expressed concerns about potential safety hazards, including access for fire and emergency services. Commenters generally supported the project, and requested additional elements be considered under the proposed action, including new alternative measures, as well as educational and recreational amenities. Twenty-nine pieces of correspondence were received during the public comment period.

In addition to the press release and newsletter, the NPS held one virtual public meeting. The virtual public meeting was held over Microsoft Teams on January 11, 2024, from 3:00 p.m. to 4:00 p.m. Pacific Standard Time. During the virtual public meeting, the project planning team presented the details of the preliminary alternatives, as well as the project background. The public was encouraged to participate by asking questions over the question-and-answer platform in Microsoft Teams. Twenty-four (estimated) people attended the virtual meeting.

Public Comment on the Environmental Assessment

The EA will be available for formal public and agency review for 30 days. Interested individuals, agencies, and organizations will be notified of its availability. The EA will be available for public review on the NPS PEPC website: https://parkplanning.nps.gov/MOJA_KelsoCima.

AGENCY CONSULTATION

The NPS initiated consultation with relevant agencies during the preparation of this EA. All agencies will be provided a copy of the EA for review. This consultation is discussed in more detail below. Copies of correspondence between NPS and the agencies, and responses from the agencies, if applicable, will be provided in the decision document.

US Fish and Wildlife Service

Endangered Species Act, Section 7 Consultation

Section 7 of the ESA requires federal agencies to consult with the USFWS to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. In accordance with section 7 of the ESA, the NPS prepared a memo-to-file and an activity form for a programmatic biological opinion for the USFWS. In March 2025, the NPS requested review and comment on the memo-to-file and an activity form from USFWS. USFWS provided a suggestion that the tortoise fence should have a U-shaped bend at every fencing terminus to prevent tortoises from entering the roadway. This change has been added to the fence design. USFWS issued concurrence that the project falls under the programmatic biological opinion on March 27, 2025.

California State Historic Preservation Officer

National Historic Preservation Act, Section 106 Consultation

Section 106 of the NHPA requires federal agencies to consider the effects of their undertakings on historic properties. Compliance with section 106 of the NHPA was carried out separately but concurrently with the planning process for the EA. As required by section 106 of the NHPA, the NPS is consulting with the California SHPO. Section 106 consultation with the California SHPO is ongoing.

Tribal Nations

National Historic Preservation Act, Section 106 Consultation

As required by section 106 of the NHPA, the NPS is consulting with federally recognized Native American Tribes that are culturally or historically affiliated with the Preserve. In January 2024, the NPS initiated consultation with the following Tribal Nations: the Colorado River Indian Tribes, Chemehuevi Indian Tribe, Fort Mojave Indian Tribe, San Fernando Band of Mission Indians, and the Twenty-Nine Palms Band of Mission Indians. No comments were received within the 30-day review period.

Section 106 consultation with Native American Tribes that are culturally or historically affiliated with the Preserve is ongoing. The NPS will complete the section 106 consultation process prior to finalizing the decision document for this EA and continue consultation with traditionally associated Native American Tribes. Furthermore, if the Tribes provide additional information on ethnographic resources or traditional uses, the NPS will work with concerned parties to resolve any potential impacts associated with the project.

Cooperating Agencies

Federal Highway Administration

The NPS is consulting with FHWA as a cooperating agency for this project. FHWA developed the preliminary design and plan-in-hand design drawings and plans for the project, and the agency is continuing to work with the NPS to revise the designs to limit the potential impacts on natural and cultural resources. Consultation efforts with FHWA are ongoing.

REFERENCES

Abatzoglou, J. T., K. T. Redmond, and L. M. Edwards

2009 "A Classification of Climate Variability in the State of California." *Journal of Applied Meteorology and Climatology.* Accessed September 25, 2024. https://doi.org/10.1175/2009JAMC2062.1

Barber J. R., K. R. Crooks, and K. M. Fristrup

2009 The costs of chronic noise exposure for terrestrial organisms. *Trends in Ecology and Evolution* 25: 180–189.

Boarman, W. I.

2002 Threats to Desert Tortoise Populations: A Critical Review of the Literature, U.S. Geological Survey, Western Ecological Research Center, Sacramento, CA.

Boarman, W. I., and W. B. Kristan

2006 Evaluation of evidence supporting the effectiveness of desert tortoise recovery actions: US Geological Survey Scientific Investigations Report 2006–5143, 27 p.

Boarman, W. I., and M. Sazaki

1996 "Highway mortality in desert tortoises and small vertebrates: success of barrier fences and culverts." Proceedings: Florida Department of Transportation/Federal Highway Administration Transportation-Related Wildlife Mortality Seminar. G. Evink, D. Ziegler, P. Garrett, and J. Berry (Eds). pp. 169–173.

Boarman, W. I., M. Sazaki, and W. B. Jennings

1997 "The effects of roads, barrier fencing and culverts on desert tortoise populations in California USA." Pages 54–58 in J. V. Abbema, ed. Proceedings: Conservation, Restoration, and Management of Tortoise and Turtles-An International Conference. State University of New York, Purchase, NY.

Calflora

2024 Calflora Observation Search. Accessed July 21, 2024. https://www.calflora.org/entry/observ.html?track=m#srch=t&cols=b&inma=t&y=35.1258&x=-115.4402&z=10&lpcli=t&pcount=x&cc=SBD&chk=t&cch=t&cnabh=t&inat=r

California Department of Fish and Wildlife

2024 California Threatened and Endangered Species. Accessed September 18, 2024. https://wildlife.ca.gov/Conservation/CESA

California Natural Resources Agency (CNRA)

2009 *California Climate Adaptation Strategy*. Accessed September 25, 2024. https://resources.ca.gov/CNRALegacyFiles/docs/climate/Statewide_Adaptation_Strategy.pdf

Council on Environmental Quality (CEQ)

2025 *Memorandum for Heads of Federal Departments and Agencies.* Executive Office of the President, Council on Environmental Quality. February 19, 2025. https://ceq.doe.gov/docs/ceq-regulations-and-guidance/CEQ-Memo-Implementation-of-NEPA-02.19.2025.pdf

Diffenbaugh, N. S., J. S. Pal, R. J. Trapp, and F. Giorgi

2005 "Fine-scale processes regulate the response of extreme events to global climate change." *Proceedings of the National Academy of Sciences* 102:15774-15778. https://doi.org/10.1073/pnas.0506042102

Digital Desert

2024 Flora and Fauna of the Mojave Preserve. Accessed September 18, 2024. https://digital-desert.com/mojave-preserve/flora-and-fauna.html

Dutcher, K. E., K. E. Nussear, J. S. Heaton, T. C. Esque, and A. G. Vandergast

2023 "Move it or lose it: Predicted effects of culverts and population density on Mojave desert tortoise (*Gopherus agassizii*) connectivity." *Plos One*, *18*(9), e0286820.

Earth Life

2023 Gilded Flickers. Accessed July 23, 2024. https://earthlife.net/gilded-flickers/

Federal Emergency Management Agency (FEMA)

n.d. National Flood Hazard Layer Viewer. https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd

2015 *Guidelines for Implementing Executive Order 11988, Floodplain Management, and Executive Order 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input*. Accessed September 26, 2024. https://www.fema.gov/sites/default/files/documents/fema_implementing-guidelines-EO11988-13690_10082015.pdf

Federal Highway Administration (FHWA)

n.d. Longitudinal Rumble Strips and Stripes on Two-Lane Roads. Accessed April 15, 2024.

2024 30% Design Plans and Drawings: Mojave National Preserve, San Bernardino County, Central Federal Lands Highway Division, US Department of Transportation, Federal Highways Administration.

Fisichelli, N. A., G. W. Schuurman, W. B. Monahan, and P. S. Ziesler

2015 "Protected area tourism in a changing climate: will visitation at US national parks warm up or overheat?" *PLoS ONE* 10 (6):e0128226. https://doi.org/10.1371/journal.pone.012822

Guida, R. J.

2011 "Climate Change and Vegetation Change in the Newberry Mountains, Southern Clark County, Nevada." Master's thesis, University of Nevada, Las Vegas.

Guttenberg, R., J. Meling, M. Sherman, and G. Severen

2024 "Archaeological Survey Report in Support of the Kelso-Cima Road and South Kelbaker Road Rehabilitation Project, Mojave National Preserve, San Bernardino County, California." October 2024.

HDR Inc. (HDR)

2024 "Aquatic Resource Delineation Report. Kelso-Cima and Kelbaker Roads Project." *CA NP MOJA* 11(2) 10(2). San Bernadino County, California. April.

Holden, P.A. and N. Fierer

2005 "Vadose Zone | Microbial Ecology." In: *Encyclopedia of Soils in the Environment*. D. Hillel (ed.). Elsevier. Pages 201–224. https://doi.org/10.1016/B0-12-348530-4/00172-7

Hughson, D. L., D. E. Busch, S. Davis, S. P. Finn, S. Caicco, and P. S. J. Verburg

2011 "Natural resource mitigation, adaptation and research needs related to climate change in the Great Basin and Mojave Desert: Workshop Summary." *U.S. Geological Survey Scientific Investigations Report* 2011-5103. http://pubs.usgs.gov/sir/2011/5103/pdf/sir20115103.pdf

Hughson, D. L, and N. Darby

2013 "Desert tortoise road mortality in Mojave National Preserve, California." *California Fish and Game* 99(4): 222–232. https://www.researchgate.net/publication/284803082_Desert_tortoise_road_mortality_in_Mojave_National_Preserve_California

Izbicki, J. A., P. Martin, and R. L. Michel

1995 "Source, movement and age of groundwater in the upper part of the Mojave River Basin, California, USA." *Application of Tracers in Arid Zone Hydrology*. IAHS Publication, Vienna.

Keeler-Wolf, T.

2007 "Mojave Desert Scrub Vegetation." in M. Barbour (ed.), *Terrestrial Vegetation of California*.

Kharin, V. V., F. W. Zwiers, X. Zhang, and G. Hegerl

2007 "Changes in temperature and precipitation extremes in the IPCC ensemble of global coupled model simulations." *Journal of Climate* 20:1419–1444.

King, C., and D. Casebier

1981 Background to Historic and Prehistoric Resources of the East Mojave Desert Region. Cultural Resources Publications.

Loehman, R.

2010 *Understanding the Science of Climate Change: Talking Points – Impacts to Arid Lands*. Natural Resource Report NPS/NRPC/NRR—2010/209. National Park Service, Fort Collins, Colorado. https://www.fs.usda.gov/rm/pubs_other/rmrs_2010_loehman_r002.pdf

Lovich, J. E., C. B. Yackulic, J. Freilich, M. Agha, M. Austin, K. P. Meyer, T. R. Arundel, J. Hansen, M. S. Vamstad, and S. A. Root

2014 "Climate Variation and Tortoise Survival: Has a Desert Species Met its Match." *Biological Conservation* 169: 214–224. https://doi.org/10.1016/j.biocon.2013.09.027

National Integrated Drought Information System (NIDIS)

n.d. California Is No Stranger to Dry Conditions, but the Drought from 2011-2017 Was Exceptional. Accessed September 26, 2024. https://www.drought.gov/california-no-stranger-dry-conditions-drought-2011-2017-was-exceptional

National Park Service (NPS)

n.d. *Mojave National Preserve Climate Friendly Parks Action Plan*. https://www.nps.gov/subjects/climatechange/upload/MOJA-CFP-Action-Plan-508Compliant.pdf.

1998 Director's Order 28: Cultural Resource Management Guideline. US Department of the Interior, National Park Service. https://www.nps.gov/parkhistory/online_books/nps28/28contents.htm

1999 *Mojave National Preserve, California, Water Resources Scoping Report*. Prepared by Mojave National Preserve and the Water Resources Division, National Park Service, in cooperation with the Department of Earth Resources, Colorado State University, Fort Collins, CO. Technical Report NPS/NRWRD/NRTR-99/225.

2000a *National Register Nomination, Kelso Depot.*

2000b *Mojave National Preserve, Revised Draft Environmental Impact Statement and General Management Plan.* US Department of the Interior, National Park Service. July.

2001 *Cultural Landscape Inventory for the Kelso Depot Historic Distric*t, Mojave National Preserve.

2002a Mojave National Preserve General Management Plan. April 2002.

2002b Procedural Manual #77-2 National Park Service Floodplain Management. US Department of the Interior, National Park Service. October. https://www.nps.gov/subjects/policy/upload/PM-77-2_10-2002_508.pdf

2003 Director's Order 77-2: Floodplain Management. September 2003.

2004 Mojave National Preserve Visitor Study. Social Science Program, Visitor Services Project. https://s3.wp.wsu.edu/uploads/sites/3019/docs/151_MOJA_rept.pdf

2006 NPS *Management Policies 2006*. Washington, DC: US Department of the Interior, National Park Service.

2007 *Cultural Landscape Inventory, Rock Springs Land and Cattle Company Historic District*, Mojave National Preserve. Pacific West Regional Office, Seattle, WA.

2009 *Mojave National Preserve Action Plan 2009*. US Department of the Interior, National Park Service.

2011a Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-Making. Washington DC: US Department of the Interior. National Park Service. https://home.nps.gov/subjects/policy/upload/DO_12_10-5-2011.pdf

2011b *Cultural Landscape Inventory, Vulcan Mine Historic District,* Mojave National Preserve. Pacific West Regional Office, Seattle, WA.

2013 *Foundation Document*, Mojave National Preserve. June 2013.

2014 *Mojave National Preserve. Environmental Assessment Reconstruct Road Segments to Improve Safety* (PMIS 18464). November 2014.

2015a *NPS NEPA Handbook.*

2015b *NPS NEPA Handbook Supplemental Guidance: Preparing Focused and Concise Environmental Assessments.*

2015c *Environmental Assessment for Proposed Housing at Kelso, Mojave National Preserve, San Bernardino County, California*. Mojave National Preserve, Barstow, CA.

2016a *Cultural Resources Climate Change Strategy*. Washington, DC: Cultural Resources, Partnerships, and Science and Climate Change Response Program, National Park Service.

2016b *Procedural Manual #77-1: Wetland Protection*. US Department of the Interior, National Park Service. www.nps.gov/subjects/policy/upload/PM-77-1_6-21-2016_508.pdf

2021 *Boundary Increase, Kelso Depot Historic District*, Mojave National Preserve.

2023 Monsoon Recovery and Operations. October. https://www.nps.gov/moja/learn/news/monsoon-recovery.htm

2024a National Park Service, Mojave National Preserve. Animals. Accessed June 27, 2024. https://www.nps.gov/moja/learn/nature/animals.htm

2024b Summary of Visitor Use by Month and Year (1997–Last Calendar Year), Mojave National Preserve. Accessed September 26, 2024. https://irma.nps.gov/Stats/SSRSReports/Park%20Specific%20Reports/Summary%20of%20Visitor%20Use%20By%20Month%20and%20Year%20(1979%20-%20Last%20Calendar%20Year)?Park=MOJA

2024c Recreation Visitors by Month (1997–Last Calendar Year), Mojave National Preserve. Accessed September 26, 2024. https://irma.nps.gov/Stats/SSRSReports/Park%20Specific%20Reports/Recreation%20Visitors%20By%20Month%20(1979%20-%20Last%20Calendar%20Year)?Park=%20MOJA

2024d Traffic Counts, Mojave National Preserve. Accessed September 26, 2024. https://irma.nps.gov/Stats/SSRSReports/Park%20Specific%20Reports/Traffic%20Counts?Park=MOJA

2024e Draft Floodplain Statement of Findings for Director's Order #77-2: Floodplain Management. Mojave National Preserve. United States Department of the Interior. National Park Service.

2025 Archeological Resources Survey in Support of the Kelso-Cima Road and South Kelbaker Road Rehabilitation Project. Mojave National Preserve. United States Department of the Interior. National Park Service. January 2025.

Natural Resources Defense Council (NRDC)

2023 Flooding and Climate Change: Everything You Need to Know. Accessed September 25, 2024. https://www.nrdc.org/stories/flooding-and-climate-change-everything-you-need-know#facts

Pater L. L., T. G. Grubb, and D. K. Delaney

2009 Recommendations for improved assessment of noise impacts on wildlife. Journal of Wildlife Management 73: 788–795.

Peaden, J. M., A. J. Nowakowski, T. D. Tuberville, K. A. Buhlmann, and B. D. Todd

2017 Effects of roads and roadside fencing on movements, space use, and carapace temperatures of a threatened tortoise. *Biological Conservation*, *214*, 13–22.

Riddell, E. A., K. J. Ikanayan, L. Hargrove, S. Tremor, J. L. Patton, R. Ramirez, B. O. Wolf, and S. R. Beissinger

2021 "Exposure to Climate Change Drives Stability or Collapse of Desert Mammal and Bird Communities." *Science* 371(6529): 633–636. https://doi.org/10.1126/science.abd4605

Shannon, G., M. F. McKenna, L. M. Angeloni, K. R. Crooks, K. M. Fristrup, E. Brown, K. A. Warner, M. D. Nelson, C. White, J. Briggs, S. McFarland, and G. Wittemyer

2015 "A synthesis of two decades of research documenting the effects of noise on wildlife." *Cambridge Philosophical Society. Biological Reviews*. 91: 982–1005. https://sites.warnercnr.colostate.edu/soundandlightecologyteam/wp-content/uploads/sites/146/2020/11/biologicalreviews2015.pdf

Stoffer, P.

2004 Desert landforms and surface processes in the Mojave National Preserve and Vicinity. Accessed September 2024. https://pubs.usgs.gov/of/2004/1007/index.html

Tinsley Becker, W.

2021 California Department of Parks and Recreation Primary Record Form update for 36-003033/CASBR-3033H. Site form on file, South Central Coastal Information Center, California State University, Fullerton.

UC Berkeley

2024 Transportation Injury Mapping System. https://tims.berkeley.edu/

University of Minnesota

2018 "Soil compaction: causes, effects and control." Accessed December 5, 2024. https://conservancy.umn.edu/items/55a395c1-5e7f-43ed-b349-040f4165cd6b

US Department of Agriculture (USDA)

2019 "Soil Compaction Symptoms, Causes, Correction, & Prevention." Accessed December 9, 2024. https://efotg.sc.egov.usda.gov/references/public/MI/324_12019_compaction.pdf

2024 US Forest Service. Monarch Butterfly Habitat Needs. Accessed on September 23, 2024. https://www.fs.usda.gov/wildflowers/pollinators/Monarch_Butterfly/habitat/index.shtml

US Department of Agriculture Natural Resources Conservation Service (USDA-NRCS)

2013 Carrizo Series. Accessed September 12, 2024. https://soilseries.sc.egov.usda.gov/OSD_Docs/C/CARRIZO.html

2015a Orwash Series. Accessed September 12, 2024. https://soilseries.sc.egov.usda.gov/OSD_Docs/O/ORWASH.html

2015b Arizo Series. Accessed September 12, 2024. https://soilseries.sc.egov.usda.gov/OSD_Docs/A/ARIZO.html

2024 Web Soil Survey. Accessed September 26, 2024. https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

US Bureau of Land Management (BLM)

1996 Army's Land Acquisition Project for the National Training Center (Ft. Irwin Expansion) Draft Environmental Impact Statement. Riverside, CA.

US Environmental Protection Agency (USEPA)

2024 A Closer Look: Temperature and Drought in the Southwest. Accessed September 16, 2024. https://www.epa.gov/climate-indicators/southwest

US Fish and Wildlife Service (USFWS)

1994a "Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Mojave Population of the Desert Tortoise." *Federal Register* 59(26): 5820–5866.

1994b *Desert Tortoise (Mojave Population) Recovery Plan*. US Fish and Wildlife Service, Portland, OR. 73 pages plus appendices.

2011 *Revised Recovery Plan for the Mojave Population of the Desert Tortoise (Mojave Population).* US Fish and Wildlife Service, Region 8, Pacific Southwest Region. Sacramento, California. 124 pages plus appendices.

2014 "Passages for Connectivity of Mojave Desert Tortoise Populations Across Fenced Roads." US Fish and Wildlife Service, Desert Tortoise Recovery Office, Reno, Nevada.

2020 Monarch (*Danaus plexippus*) Species Status Assessment Report, version 2.1. Accessed October 9, 2024.

2022 *Range-wide Monitoring of the Mojave Desert Tortoise (Gopherus agassizii): 2021 Annual Reporting*. Report by the Desert Tortoise Recovery Office, US Fish and Wildlife Service, Reno, Nevada. https://www.fws.gov/sites/default/files/documents/USFWS.2022%20report.%20Rangewide%20monitoring%20report%202021.pdf

2025 "Information for Planning and Consultation (IPaC) Resource List." Accessed March 19, 2025. http://ecos.fws.gov/ipac/

von Seckendorff Hoff, K., and R. W. Marlow

2002 "Impacts of vehicle road traffic on desert tortoise populations with consideration of conservation of tortoise habitat in southern Nevada." *Chelonian Conservation and Biology*, 4(2): 449–456.

Waters, H.

2021 "How Climate Change Pushes Even the Hardiest Desert Birds Past Their Limit." Audubon. February 4, 2021. https://www.audubon.org/news/how-climate-change-pushes-even-hardiest-desert-birds-past-their-limit#:~:text=The%20Mojave%20Desert%2C%20like%20many%20deserts%20across%20the,has%20declined%20by%2020%20percent%20in%20some%20areas

Wilson, M., and L. C. Neff

2000 WACC Project No. MOJA 2000 C: Archaeological Testing and Assessment at Kelso Depot, Mojave National Preserve, San Bernardino County, California.

Yin J., Y. Gao, R. Chen, D. Yu, R. Wilby, N. Wright, Y. Ge, J. Bricker, H. Gong, and M. Guan

2023 "Flash floods: why are more of them devastating the world's driest regions?" *Nature*. 615: 212–215. https://doi.org/10.1038/d41586-023-00626-9