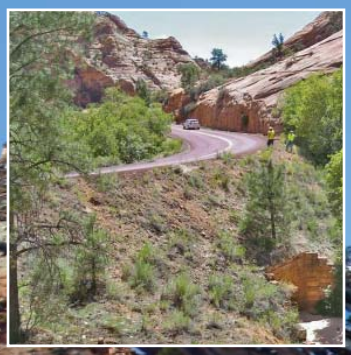
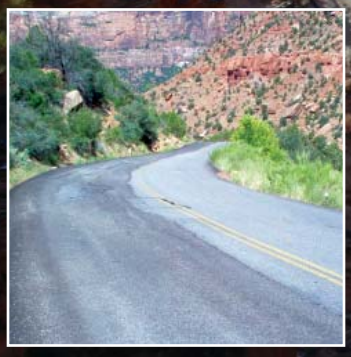
National Park Service
U.S. Department of the Interior

Zion National Park
Utah

Zion-Mt. Carmel Highway Rehabilitation Environmental Assessment/Assessment of Effect

June 2009





Zion-Mt. Carmel Highway Rehabilitation

Environmental Assessment/Assessment of Effect

Summary

Zion National Park (Zion or park) proposes to rehabilitate, restore, and resurface about 9.5 miles of the Zion-Mt. Carmel Highway (highway). The highway extends from the intersection of the Zion Canyon Scenic Drive to the East Park Entrance. The project is being considered to address deficiencies in the condition of the highway and safety concerns. The highway has not been substantially rehabilitated since it was completed in 1930. The proposed rehabilitation would improve the efficiency of park operations by correcting structural deficiencies in the road and reducing maintenance requirements, as well as providing for improved visitor enjoyment and safety while protecting park scenic, natural, and cultural resources.

This Environmental Assessment/Assessment of Effect (EA) evaluates two alternatives: a no action alternative and a preferred action alternative. Under the No Action Alternative, the highway would not be rehabilitated or improved. Zion staff would continue routine road maintenance, minor repairs, and snow removal as it has in the past. The road pavement and structural integrity would continue to deteriorate and drainage problems would persist. The Preferred Alternative includes a number of measures to rehabilitate and improve the condition of the highway and roadside facilities. Proposed highway improvements include correcting road subgrade problems, paving, repairing and installing new drainage measures, repairing damaged guard walls, installing new guard walls and curbing, improving roadside pullouts, installing new signs and posts, and adding a new comfort station.

This EA has been prepared in compliance with the National Environmental Policy Act (NEPA) to provide the decision-making framework that 1) analyzes a reasonable range of alternatives to meet objectives of the proposal, 2) evaluates potential issues and impacts to Zion's resources and values, and 3) identifies mitigation measures to lessen the degree or extent of these impacts. Resource topics evaluated in detail in this document are geology; soils; vegetation; wildlife; special status species; hydrology and water quality; historic structures; archeological resources; cultural landscape; visitor experience and recreational resources; soundscape; public health, safety, and park operations; and socioeconomics. All other resource topics were dismissed because the project would result in negligible to less than minor effects. No major effects were identified as a result of this project. No adverse effects on cultural resources under Section 106 of the National Historic Preservation Act would occur. Public scoping was conducted to assist with the development of this document and comments were received and considered in the evaluation of effects.

Public Comment

If you wish to comment on this EA, you may post comments online using the National Park Service Planning, Environment and Public Comment (PEPC) website at: http://parkplanning.nps.gov or mail comments to: Superintendent; Zion National Park, Springdale, UT 84767.

This EA will be on public review for 30 days. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

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Acronyms and Abbreviations

APE	Area of Potential Effect
BA	Biological Assessment
BMP	Best Management Practice
CEQ	Council of Environmental Quality
CFLHD	Central Federal Lands Highway Division
Corps	U.S. Army Corps of Engineers
EA	Environmental Assessment/Assessment of Effect
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
GMP	General Management Plan
highway	Zion-Mt. Carmel Highway
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
PAC	Protected Activity Center (Mexican spotted owls)
PEPC	Planning, Environment and Public Comment
SHPO	State Historic Preservation Office
switchbacks	Highway west of tunnel
SWPPP	Storm water pollution prevention plan
tunnel	Zion-Mt. Carmel Tunnel
UDWR	Utah Division of Wildlife Resources
USFWS	U.S. Fish and Wildlife Service
UTPDES	Utah Pollutant Discharge Elimination System

ENVIRONMENTAL ASSESSMENT/ASSESSMENT OF EFFECT
ZION–MT. CARMEL HIGHWAY REHABILITATION
ZION NATIONAL PARK

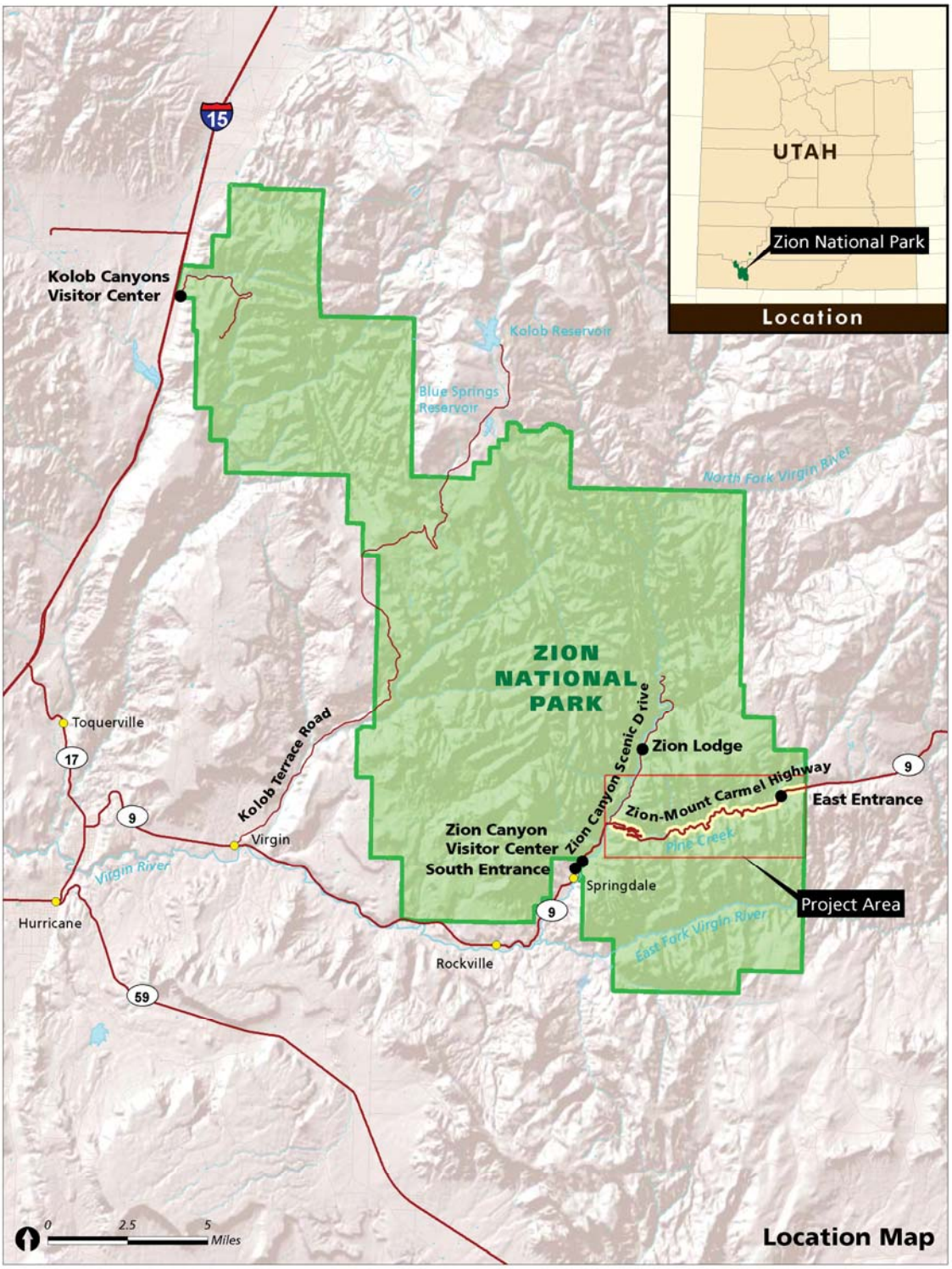
INTRODUCTION

Zion National Park (Zion or park) of the National Park Service (NPS), in cooperation with Central Federal Lands Highway Division (CFLHD) of the Federal Highway Administration (FHWA), is considering rehabilitation of the Zion-Mt. Carmel Highway (highway). Rehabilitation of the highway is needed because of the deteriorating condition of the road since its completion in 1930. The highway, also known as Park Route 10, extends from the intersection with Zion Canyon Scenic Drive (Park Route 11) at Canyon Junction to the East Park Entrance and park boundary. The highway is located in Washington and Kane counties, Utah (Figure 1). The 9.5-mile project area excludes the 1.1-mile Zion-Mt. Carmel Tunnel (tunnel).

The highway is one of the most popular scenic destinations in Zion and provides year-round access to a variety of recreation opportunities. Popular recreation sites served by the road include the Canyon Overlook Trail and Checkerboard Mesa. Numerous pullouts along the highway provide opportunities for viewing sandstone rock canyons, rock towers, and mesas. The highway also supports travel connections to Grand Canyon, Bryce Canyon, and Capital Reef National Parks.

This Environmental Assessment/Assessment of Effect (EA) was prepared to evaluate potential environmental, socioeconomic, and cultural resource effects from the Preferred Alternative to rehabilitate the highway and a No Action Alternative that does not rehabilitate or improve the highway. The EA was prepared in compliance with the National Environmental Policy Act (NEPA) of 1969 and implementing regulations, 40 CFR Parts 1500-1508 and NPS Director's Order – 12 and Handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making.* The NEPA process (40 CFR 1500-1508) is being used to comply with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), and implementing regulations, 36 CFR Part 800. The EA will determine whether significant impacts would occur as a result of the proposed project and if an Environmental Impact Statement (EIS) or Finding of No Significant Impact (FONSI) would be required.

FIGURE 1. PROJECT LOCATION



PROJECT PURPOSE AND NEED

Project Purpose

The purpose of the proposed project is to rehabilitate, restore, and resurface about 9.5 miles of the highway from its intersection with Zion Canyon Scenic Drive to the eastern park boundary (Figure 1). Road improvements are needed to correct structural deficiencies in the roadway subgrade, deteriorating pavement, inadequate drainage, and needed improvements to stone masonry guard walls and pullouts. Proposed improvements would provide a pleasant driving experience, improve traffic and pedestrian safety, and facilitate maintenance and snow removal operations. The objectives of the proposed project are to:

Improve the Efficiency of Park Operations

- Repair damaged and deteriorating road pavement, drainage, stone masonry guard walls, and other structural features
- Reduce maintenance requirements and costs due to deficiencies in the condition of the road

Provide for Visitor Enjoyment and Safety

- Improve the roadway condition to more safely accommodate traffic
- Improve access and safety at visitor pullouts
- Reduce the incidence and risk of traffic accidents
- Provide a new comfort station for visitor convenience
- Efficiently implement rehabilitation work while minimizing visitor impact

Protect Park Resources

- Maintain the scenic quality of the road
- Protect park natural and cultural resources and values

Project Need

The proposed project is being considered because of the need to address deficiencies in the condition of the road and safety concerns. The road was originally completed in 1930 and since that time, there has been no substantial rehabilitation of the road other than routine periodic maintenance such as asphalt patches, overlays, crack-sealing, chip-sealing, and minor repairs and improvements.

Poor drainage, frost heaving, infiltration of water under the road pavement, and heavy traffic have contributed to the deterioration of the highway. The current pavement is extremely aged in many locations, which has led to a pavement condition with surface cracks, rutting, buckling, and unraveling of the pavement edge (Figure 2 and Figure 3). Portions of the road, particularly in the switchback section, contain areas of soft or poorly drained subgrade where the road has settled. Surface drainage that gets between the asphalt pavement and stone masonry guard walls is causing erosion and settling of the walls. All references to guard walls in this document are referring to stone masonry guard walls. Drainage improvements also are needed to address surface and subsurface drainage conditions near an active slide in the switchback section. A tight turning radius and steep pavement cross-slope on switchback turns makes it difficult for buses and large vehicles to

negotiate, which creates safety issues because the rear wheels of large vehicles are off the pavement or the vehicles cross into the oncoming lane. These conditions contribute to deterioration of the road surface at switchback corners. Concentrated roadway runoff is eroding the roadway embankment and the edge of the pavement in some locations. Poor drainage has led to erosion at the base and end of stone guard walls. Improvements to cross-culverts, ditches, and culvert outlets are needed to improve drainage and protect the road and fill slopes from erosion.

FIGURE 2. PAVEMENT DISTRESS IN SWITCHBACKS

FIGURE 3. PAVEMENT EDGE DETERIORATION

Approximately 76 vehicle accidents have been reported on the highway from 2004 to 2008 (NPS 2009). Some accidents may be attributable to the conditions of the road surface, slope, location of pullouts, and poor sight distance. Drainage problems contribute to prolonged icy roads, hazardous driving conditions, and the need for application of additional traction sand.

Several of the roadside pullouts need to be enlarged slightly, paved, or obliterated to protect adjacent resources and improve safety for the many visitors that stop to enjoy the scenery, take photographs, or access trails. Construction of a comfort station at an existing large pullout near the East Entrance Station also is proposed to meet visitor needs because of the lack of convenient restroom facilities on the east side of the park.

PURPOSE AND SIGNIFICANCE OF ZION NATIONAL PARK

Zion was initially established as the Mukuntuweap National Monument in 1909. In 1918, a presidential proclamation enlarged the monument and changed its name to Zion National Monument. Congress established the area as a national park in 1919 with the addition of the Kolob Canyons area to the park in 1956. The park currently encompasses 148,016 acres.

The purposes, significance, and mission goals of Zion National Park, as outlined in the General Management Plan (NPS 2001), underlie how the park is managed. The purposes tell why the park was set aside as a unit in the national park system. The significance of the park addresses why the area is unique—why it is important enough to our natural and/or cultural heritage to warrant national park designation, and how it differs from other parts of the country. Zion's mission goals articulate the ideal future conditions the NPS is striving to attain.

The purposes of Zion National Park are to:

- Preserve the dynamic natural process of canyon formation as an extraordinary example of canyon erosion
- Preserve and protect the scenic beauty and unique geologic features: the labyrinth of remarkable canyons, volcanic phenomena, fossiliferous deposits, brilliantly colored strata, and rare sedimentation
- Preserve the archeological features that pertain to the prehistoric races of America and the ancestral Indian tribes
- Preserve the entire area intact for the purpose of scientific research and the enjoyment and enlightenment of the public
- Provide a variety of opportunities and a range of experiences, from solitude to high use, to assist visitors in learning about and enjoying park resources without degrading those resources

Zion National Park is significant for the following reasons:

- Zion's stunning scenery features towering, brilliantly colored cliffs and associated vegetation highlighted by a backdrop of contrasting bright, southwestern skies.

- Zion is a geologic showcase with sheer sandstone cliffs among the highest in the world.
- The Virgin River — one of the last mostly free-flowing river systems on the Colorado Plateau — is responsible for the ongoing carving of this deeply incised landscape.
- Because of its unique geographic location and variety of life zones, Zion is home to a large assemblage of plant and animal communities.
- Zion preserves evidence of human occupation from prehistoric to modern times, including American Indian sites, remnants of Mormon homesteading, and engineering and architecture related to park establishment and early tourism.

The mission goals of Zion National Park are to:

- Provide park visitors educational and recreational opportunities that foster an appreciation of Zion and its resources
- Ensure that visitor impacts do not impair resources
- Maintain the resources, including plant and animal communities, at healthy and viable levels consistent with natural processes
- Manage cultural and physical resources to ensure long-term integrity
- Ensure that the built environment provides for safe visitor and staff uses in a sustainable and cost-effective manner
- Ensure that the organization is responsive to employee needs, recognizing the contributions of each individual
- Foster mutually supportive partnerships with private and public organizations and individuals to achieve visitor use and resource protection goals

RELATED PLANNING DOCUMENTS

Zion National Park General Management Plan

The highway corridor and East Entrance area are part of the frontcountry development zone where visitor use is high. The General Management Plan indicates that with the exception of possible new restrooms, picnic areas, and pulloff upgrades or removal, there will be no new trails or visitor facilities along the highway (NPS 2001). The existing highway is consistent with the GMP direction to maintain travel and access between the park's South and East entrances.

Management Policies 2006

NPS *Management Policies 2006* provides guidance for management of all national park units. Road systems are addressed in Section 9.2.1, which states "park roads will be well constructed, sensitive to natural and cultural resources, reflect the highest principles of park design, and enhance the visitor experience."

The purpose of park roads is to enhance visitor experience by providing access to park facilities, resources, and recreational opportunities. Park roads are not intended to provide

fast and convenient transportation, but rather to access areas of recreation while being sensitive to the natural and cultural resources in the area (Section 9.2.1.1 *Management Policies*). Park roads provide access for the protection, use, and enjoyment of the resources that constitute the park. The highway provides important access between the park's South and East entrances and regional connections to other state highways and communities.

1984 NPS Park Roads Standards

The 1984 NPS Park Roads Standards states that roads in national parks serve a distinctly different purpose from most other road and highway systems. Among all public resources, those of the national park system are distinguished by their unique natural, cultural, scenic, and recreational qualities. Park roads are to be designed with extreme care and sensitivity to provide access for the protection, use, and enjoyment of the resources that constitute the national park system.

Director's Order – 87A: Park Roads and Parkways

Director's Order – 87A states that park roads are constructed only where necessary to provide access for the protection, use, and enjoyment of the natural, historical, cultural, and recreational resources that constitute our national park system. Park roads should enhance the visitor experience while providing safe and efficient accommodation of park visitors and to serve essential management action needs. Park roads are designed with extreme care and sensitivity with respect to the terrain and environment through which they pass—they are laid lightly onto the land.

BACKGROUND

The Zion-Mt. Carmel Highway was constructed between 1927 and 1930 for the purpose of linking Zion National Park with Bryce Canyon National Park, Cedar Breaks National Monument, and the North Rim of the Grand Canyon. The highway is located in canyon country characterized by extensive rock outcrops and steep slopes. The 3.5-mile portion of the road on the west side of the tunnel consists of a series of steep switchbacks. The 6.0-mile section of the highway east of the tunnel, while less steep, winds through a landscape of massive rock outcrops, canyons, and mesas. Original construction of the highway presented many unique challenges because of the steepness of the terrain and the need to construct a 1.1-mile tunnel to connect the east and west portions of the highway. Today, the highway is the only east-west route through the park. The highway provides access to scenic attractions in the park and continues to provide regional connections to southern Utah and northern Arizona via State Highways 9 and 89. Zion receives about 2.7 million visitors annually. About 250,000 vehicles enter the park through the East Entrance and travel the highway. It is estimated that a similar number of vehicles may travel along the highway from visitors who enter the park through the South Entrance and either exit through the East Entrance or make the round-trip scenic drive on the highway. Thus, annual traffic on the highway is estimated at about 500,000 vehicles per year.

Improvements to the highway since original construction have been limited primarily to pavement overlays and maintenance; however, in 2007, several road rehabilitation measures were implemented on each side of the tunnel entrance. Improvements on the east side of the tunnel included slurry sealing the road surface; scaling rock slopes; reconfiguring two

parking areas; creating a painted center median with rumble strips; relocating a cross walk and construction of a sidewalk from a parking area to the Canyon Overlook Trail; eliminating three informal pullouts and reconfiguring one pullout into a slow vehicle passing lane; implementing erosion control measures; and relocating the ranger kiosk. On the west side of the tunnel, rumble strips were added to the existing painted center median and the ranger kiosk was replaced. These measures were implemented to provide safer traffic control for park rangers and visitors, reduce the risk of rockfall, and protect park resources by controlling erosion. Proposed highway improvements considered in the current EA are intended to further improve safety and road conditions for the remainder of the highway.

SCOPING

Scoping is an early and open process to determine the breadth of issues and alternatives to be addressed in an environmental assessment. The staff of Zion, resource professionals of the NPS-Denver Service Center, and the FHWA conducted internal scoping. This interdisciplinary process defined the purpose and need, identified potential actions to address the need, determined the likely issues and impact topics, and identified the relationship of the proposed action to other planning efforts at Zion.

Zion initiated public scoping with a press release on November 10, 2008 to provide the public and interested parties an opportunity to comment on the proposed project (Appendix A). The park also sent letters to 100 interested individuals; organizations; state, county, and local governments; and federal agencies describing the proposed action and asking for comment. American Indian tribes (The Navajo Nation, Kaibab Band of Paiute Indians, Las Vegas Paiute Tribe, Paiute Indian Tribe of Utah, Moapa Band Paiute Tribe, Shivwits Paiute Band, Skull Valley Goshute Tribe, Goshute Indian Tribe, Pueblo of Zuni, Hopi Tribe, and Northern Ute Tribe) were also sent an information letter on November 10, 2008 describing the project and asking for comments. Comments were solicited through December 11, 2008. The park received 20 scoping comments, including 12 from individuals, one from a local business, two from a cycling club, and comments from the Washington County Commissioners, the Utah Department of Water Quality, the Utah State Historic Preservation Office, the Hopi Tribe, and the Confederated Tribes of the Goshute Reservation. In general, comments supported the proposed project, but several concerns were expressed in scoping comments, including:

- Request for the addition of a bike lane to better accommodate cyclists
- Concern that the road should be taken back to its historic configuration and the road not be widened
- Request for a shuttle with ranger tours and larger pullouts to accommodate buses
- Request to protect archeological sites, historic sites, and traditional cultural properties
- Concern with potential impacts to water quality and fish spawning areas

The NHPA (16 United States Code [U.S.C.] 470 et seq.); NEPA; NPS Organic Act; NPS *Management Policies* 2006; Director's Order – 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making* (2001); and Director's Order – 28: *Cultural Resources Management Guideline* require the consideration of impacts on cultural resources, either

listed in or eligible to be listed in, the National Register of Historic Places (NRHP). The highway is listed in the NRHP. The Utah State Historic Preservation Office (SHPO) was notified of the project by letter dated November 10, 2008, and early input into the project was solicited. The park will cooperate with the SHPO to address mitigation of impacts to historical features from the proposed action.

In November 2008, the park contacted the U.S. Fish and Wildlife Service (USFWS) to discuss the level of consultation needed for the proposed Zion Mt. Carmel Highway Rehabilitation EA. At that time, the park believed the work could be accomplished outside the breeding season for Mexican spotted owl. Because of this, the park believed that the EA would find a no effect determination for Mexican spotted owl and its critical habitat. With a "no effect" determination, written concurrence from the USFWS is not required. Since that time, it has become clear that all of the proposed work cannot occur outside the breeding season. In April 2009, the park began formal consultation with the USFWS. The USFWS will review this EA to determine if they concur with the park's finding of "may affect, not likely to adversely effect" and whether additional conservation measures are needed to protect listed species.

Internal and external scoping comments were considered in the choice of impact topics and were used in the development and evaluation of alternatives discussed in this EA. Scoping issues or impact topics that were considered, but not evaluated further, are discussed below in "Impact Topics Dismissed from Further Consideration."

The public, agencies, and American Indian groups traditionally associated with the lands of Zion will also have an opportunity to review and comment on this EA.

APPROPRIATE USE

Section 1.5 of *Management Policies* (2006), Appropriate Use of the Parks, directs the NPS to ensure that allowed park uses would not cause impairment of, or unacceptable impacts on, park resources and values. Existing authorized or a new form of park use may be allowed within a park only after a determination has been made in the professional judgment of the park manager that it will not result in unacceptable impacts.

Section 8.1.2 of *Management Policies* (2006), Process for Determining Appropriate Uses, provides evaluation factors for determining appropriate uses. All proposals for park uses are evaluated for:

- Consistency with applicable laws, executive orders, regulations, and policies;
- Consistency with existing plans for public use and resource management;
- Actual and potential effects on park resources and values;
- Total costs to the NPS; and
- Whether the public interest will be served.

Park managers must continually monitor all park uses to prevent unanticipated and unacceptable impacts. If unanticipated and unacceptable impacts emerge, the park manager

must engage in a thoughtful, deliberate process to further manage or constrain the use, or discontinue it.

The Zion-Mt. Carmel Highway, in its present configuration, has been in continuous use since it was constructed. The existing Zion-Mt. Carmel Highway is consistent with the park's General Management Plan (NPS 2001) to maintain travel and access between the park's South and East entrances. The NPS finds that providing automobile access along the highway and to trailheads and other points of interest along the road is an acceptable use at Zion.

ISSUES AND IMPACT TOPICS

Issues

Issues and impact topics were developed from the questions and comments brought forth during internal and external scoping. Issues identified in scoping that were evaluated in the EA were potential effects on geology, soils; vegetation; wildlife; special status species; hydrology and water quality; cultural resources; visitor experience and recreational resources; soundscape; public health, safety, and park operations; and socioeconomics. Table 1 discusses the impact topics; the reasons for retaining the topic; and the relevant laws, regulations, and policies.

TABLE 1. IMPACT TOPICS RETAINED FOR FURTHER EVALUATION AND RELEVANT LAWS, REGULATIONS, AND POLICIES

Impact Topic	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
Geology	The switchback section of the highway is constructed in an area of historic landslides and further movement or slumping can be influenced by road drainage.	NPS *Management Policies 2006*
Soil	Rehabilitation of the road, drainage improvements, work on pullouts, and other activities would result in disturbance to soils.	NPS *Management Policies 2006*
Vegetation	Roadside vegetation disturbance and the introduction of invasive nonnative species are possible from ground-disturbing activities during road rehabilitation.	NPS Organic Act; NPS *Management Policies 2006*; Resource Management Guidelines (NPS-77); Federal Noxious Weed Control Act; Executive Order 13112; Invasive Species (1999)
Wildlife	Construction activities and noise could affect wildlife in the project area. No wildlife habitat would be lost. The project area contains habitat for desert bighorn sheep and small mammals, lizards, and other native species.	NPS Organic Act; NPS *Management Policies 2006*; NPS-77
Special Status Species	Federally threatened Mexican spotted owls breed in the park and California condors are summer migrants in the park. Although no direct impact to endangered species habitat is anticipated, both bird species could potentially be affected by disturbance from noise and activities during construction. Peregrine falcons nest near the project area and other sensitive species may be present.	Endangered Species Act; NPS *Management Policies 2006*; 16 U.S.C. 1535 Section 7(a)(2)
Hydrology and Water Quality	Temporary effects on water quality are possible during construction from erosion and introduction of sediment to drainages. Proposed drainage improvements are intended to have beneficial hydrologic effects.	Clean Water Act; Fish and Wildlife Coordination Act of 1934 (PL 85-624), as amended; Executive Order 12088; NPS *Management Policies 2006;* NPS-77

Impact Topic	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
Cultural Resources — Historic Structures, Archeological Resources, and Cultural Landscape	The highway is listed in the NRHP, and a number of the historic features along the highway that contribute to its historic significance would be affected by the proposed project. There is also concern that any new structural features added should maintain the historic character of the highway. Known archeological features are present near the road. The cultural landscape of the highway also would be affected by the proposed project.	Section 106 of the NHPA of 1966, as amended (16 U.S.C. 470, et seq. and 36 CFR 800); Executive Order 13084 of May 14, 1998; Executive Order 13007 of May 24,1996; American Indian Religious Freedom Act of 1978; the Native American Grave Protection and Repatriation Act of 1990; Indian Trust Resources: Secretarial Order 3175; Director's Order – 28; NPS *Management Policies 2006*
Visitor Experience and Recreational Resources	Traffic management for the highway rehabilitation would impact visitor travel and the recreation experience during construction as a result of traffic delays, temporary short-term road closures, closed parking areas or pullouts, increased noise and night lighting, and temporary changes in the scenic quality from construction equipment and disturbances. The proposed improvements would provide long-term benefits to the visitor experience.	NPS *Management Policies 2006*
Soundscape	Noise associated with road rehabilitation, equipment operation, truck traffic, and night construction activities would result in a temporary increase above ambient sound levels.	NPS *Management Policies 2006;* Director's Order – *47: Sound Preservation and Noise Management*
Public Health, Safety, and Park Operations	Construction activities would require temporary changes in park operations to address traffic control and keep the public informed about road conditions. Road maintenance, snow removal, and visitor safety would benefit from road rehabilitation and improvements.	NPS *Management Policies 2006: OMB Circular A-123; Federal 'Managers' Financial Integrity Act of 1982 (31 U.S.C. 3512(d)); Government Performance and Results Act of 1993 (GPRA)*
Socioeconomics	Construction-related traffic delays and disturbances along the highway would impact tourism traffic and expenditures that support local gateway communities. Construction work would provide a short-term increase in employment opportunities and local spending on goods, services, and materials.	*NPS Management Policies 2006*

Impact Topics Dismissed from Further Consideration

The following impact topics or issues were eliminated from the list of potential impacts because there would be adverse impacts of minor intensity or less.

Wetlands

Executive Order (EO) 11990, NPS *Management Policies 2006*, and Director's Order – 77-1 direct that wetlands be protected and that wetlands and wetland functions and values be preserved. These orders and policies further direct that direct or indirect impacts to wetlands be avoided whenever there are practicable alternatives. The only wetland potentially affected in the project area is found along a narrow roadside ditch at the Springbend Switchback west of the tunnel. Proposed drainage improvements at this location to prevent water from seeping under the roadway would impact less than 0.1 acre of wetlands. The NPS would

request a Nationwide 404 Permit for the incidental impact to the wetlands. Because impacts to wetlands would be negligible, this topic was dismissed from detailed discussion in this EA.

Prime or Unique Farmland

In 1980, the CEQ directed federal agencies to assess the effects of their actions on farmland soils classified as prime or unique by the United States Department of Agriculture, Natural Resources Conservation Service. Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; and unique farmland produces specialty crops such as fruits, vegetables, and nuts. There are no prime or unique farmlands associated with the project area; therefore, prime or unique farmland was dismissed as an impact topic in this EA.

Air Quality and Climate Change

Zion is a designated Class I airshed, which under the Clean Air Act, prevents significant deterioration of air quality. Earthwork and hauling material during construction would temporarily increase dust and vehicle emissions under the Preferred Alternative and would result in localized effects on air quality. Hydrocarbons, nitrogen oxide, and sulfur dioxide vehicle emissions would be rapidly dissipated; and visibility, deposition, and other air quality-related values are not expected to be appreciably impaired. These effects would be short-term, negligible, and adverse. Road rehabilitation would not result in an increase in traffic or vehicle emissions. Neither overall park air quality nor regional air quality would be more than negligibly affected by the short-term increase in emissions. Under the Preferred Alternative, some greenhouse gases, such as carbon dioxide would be emitted from the use of heavy equipment and trucks. These emissions would be small and would not contribute to climate change. The No Action Alternative would have no effect on existing air quality. Because the Preferred Alternative would result in short-term negligible adverse effects and the No Action Alternative would have no effect, air quality and climate change were dismissed as impact topics in this EA.

Environmental Justice

Presidential Executive Order 12898, *General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. According to the Environmental Protection Agency, environmental justice is the

> …fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

The goal of 'fair treatment' is not to shift risks among populations, but to identify potentially disproportionately high and adverse effects, and identify alternatives that may mitigate these impacts.

Rockville, Springdale, Hurricane, and surrounding communities contain both minority and low-income populations; however, environmental justice is dismissed as an impact topic for the following reasons:

- The park staff and planning team actively solicited public participation as part of the planning process and gave equal consideration to all input from persons regardless of age, race, income status, or other socioeconomic or demographic factors.
- Implementation of the Preferred Alternative would not result in any identifiable adverse human health effects. Therefore, there would be no direct or indirect adverse effects on any minority or low-income population.
- The impacts associated with implementation of the Preferred Alternative would not disproportionately affect any minority or low-income population or community.
- Implementation of the Preferred Alternative would not result in any identified effects that would be specific to any minority or low-income community.
- The impacts to the socioeconomic environment resulting from implementation of the Preferred Alternative may have short-term adverse economic effects, but over the long-term effects would be beneficial. In addition, the park staff and planning team do not anticipate the impacts on the socioeconomic environment to appreciably alter the physical and social structure of nearby communities.

Visual Resources

Visual impacts from construction activities under the Preferred Alternative would be short-term, negligible, and localized. Visual impacts would occur during construction from the presence of construction equipment, materials, and ground disturbances. Rehabilitation of damaged sections of the existing road would improve the visual quality of the road. Any disturbances to existing structural features or new structural features, such as guard walls would be constructed with material to match the color, texture, and character of existing facilities. Construction of a new public comfort station at an existing pullout near the East Entrance under the Preferred Alternative would add a small new feature to the road corridor. The comfort station would be designed to blend with the environment and facilities in the park. The long-term visual impact of the road rehabilitation and improvements would not adversely affect any viewsheds. The scenic views for which Zion is renowned would not be adversely affected by the Preferred Alternative. Under the No Action Alternative, road conditions would continue to deteriorate, which would detract from the scenic quality of the highway corridor. The long-term effect on visual quality would be beneficial under the Preferred Alternative, with a long-term minor adverse effect under the No Action Alternative; therefore, visual resources were dismissed as an impact topic in this EA.

Lightscape

In accordance with NPS *Management Policies* 2006, the NPS strives to preserve natural ambient landscapes, which are natural resources and values that exist in the absence of human-caused light. Zion strives to limit the use of artificial outdoor lighting to that which is necessary for building security and human safety. The park also strives to ensure that all outdoor lighting is shielded to the maximum extent possible to keep light on the intended subject and out of the night sky. No structures or outdoor lighting are proposed for road improvements. Night construction is possible, which would introduce artificial night lighting within the construction area. Lights used for night work on the west side of the tunnel may be visible from park campgrounds and visitors traveling along the Zion Canyon Scenic Drive. Lights used for night construction activities would be shielded and directed downward to minimize impacts. Construction vehicles traveling along Park Route 10 during the night are expected to be limited with only a slight increase over normal night traffic. The impact of this local short-term night illumination would be negligible to minor. For this reason, lightscape was dismissed as an impact topic in this EA.

Floodplains

Executive Order 11988 – *Floodplain Management* requires an examination of impacts to floodplains and potential risks involved in placing facilities within floodplains. NPS *Management Policies 2006* and Director's Order – *77-2: Floodplain Management* provides guidelines for proposed actions in floodplains. No areas of flooding have been identified in the project area (FEMA 2009). Under the Preferred Alternative, no proposed work activities or structures would be located in a floodplain. Because there would be no impact to floodplains under either alternative, floodplains were dismissed as an impact topic in this EA.

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by Department of the Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights. The order represents a duty to carry out the mandates of the federal law with respect to American Indian and Alaska Native tribes. There are no Indian trust resources in Zion National Park. The lands comprising the park are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, Indian trust resources were dismissed as an impact topic in this EA.

Ethnographic Resources

Ethnographic resources are defined by the NPS as any "site, subsistence, or other significance in the cultural system of a group traditionally associated with it" (Director's Order-28). Eleven affiliated American Indian tribes are traditionally associated with Zion. The tribal contacts were sent an informational letter on November 10, 2008, describing the proposed project and the NPS desire to hear their comments. Scoping comments were received from two of the tribes consulted, but no specific issues related to ethnographic resources were identified. This EA was also sent to each tribe for their review and comment. If subsequent issues or concerns are identified, appropriate consultations would be

undertaken. According to NPS professional staff and the GMP (2001), to date, no ethnographic resources within the park have been determined eligible for listing in the National Register of Historic Places (NRHP). Because it is unlikely that ethnographic resources would be affected by the proposed project, and because appropriate steps would be taken to protect any ethnographic resources that are inadvertently discovered, the topic of ethnographic resources was dismissed as an impact topic.

Museum Collections

Museum collections include historic artifacts, natural specimens, and archival and manuscript material. These collections may be threatened by fire, vandalism, natural disasters, and careless acts. The preservation of museum collections is an ongoing process of preventative conservation, supplemented by conservation treatment, when necessary. The primary goal is preservation of artifacts in the most stable condition possible to prevent damage and minimize deterioration. The proposed activities along the highway would not affect the museum objects of Zion and there is no potential to add objects to the collection; therefore, museum collections were dismissed as an impact topic in this EA.

Wilderness

On March 30, 2009, President Barack Obama signed into law the Omnibus Public Land Management Act of 2009, which resulted in the designation of 124,000 acres of wilderness in Zion. The proposed highway rehabilitation is located outside of wilderness boundaries and, therefore, is not subject to Wilderness Act requirements. Because there would be no direct effects on wilderness resources and values, this topic was dismissed from further evaluation in this EA.

Wild and Scenic Rivers

The Omnibus Public Land Management Act of 2009 designated 153 miles of the Virgin River and tributaries to the Virgin River within the park as wild and scenic rivers. Two Virgin River tributary segments are adjacent to or in close proximity to the highway. Clear Creek parallels the highway from the eastern park boundary to the junction with Pine Creek (6.4 miles). From this junction, Pine Creek extends west until it flows into the North Fork of the Virgin River below the switchbacks west of the tunnel (3 miles). Both river segments were classified as recreational under the wild and scenic river designation.

The outstandingly remarkable values identified for these segments in the Zion General Management Plan (NPS 2001) included geology and wildlife. The plan states the following for geology: “The value is one of the most significant in the region for geologic/hydrologic feature abundance, diversity of features, and educational/scientific value.” And the following for wildlife: “The value is one of the most significant in the region for species diversity, species abundance, natural reproduction, and wildlife viewing.” The implementation of either the No Action or the Preferred Alternative would have a negligible effect on the identified outstanding remarkable values. As discussed in the Hydrology and Water Quality section, the No Action and Preferred Alternative would have short-term minor effects on water quality in Clear Creek or Pine Creek from possible erosion and the Preferred Alternative would have long-term benefits to water quality from drainage improvements. Impacts to water quality under either of the alternatives would not affect the wild and scenic river status of Clear Creek or Pine Creek. Because impacts would be no greater than

negligible and wild and scenic river status would not be affected, this impact topic was dismissed in this EA.

Energy

The Preferred Alternative would require expenditures of energy, including natural and depletable resources, during construction; however, the use would be short-term and have negligible impacts to energy resources with no appreciable effect on energy availability or costs. Because impacts would be no greater than negligible, energy resources was dismissed as an impact topic in this EA.

ALTERNATIVES

INTRODUCTION

This chapter describes the No Action Alternative and the Preferred Alternative for rehabilitation of the highway. The No Action Alternative would not rehabilitate the highway and would continue the present level of management, operations, and maintenance. The Preferred Alternative was developed to address the purpose and need for the project to rehabilitate, restore, and resurface the highway, while protecting and preserving park natural and cultural resources.

The Preferred Alternative presents the NPS's preferred management action and defines the rationale for the action in terms of resource protection and management, visitor and operational use, cost, and other applicable factors. Other alternatives that were considered but eliminated from detailed analysis are discussed in this chapter. Also included in this chapter is a comparison of how well the alternatives meet project objectives and a summary comparison of the environmental effects of each of the alternatives.

NO ACTION ALTERNATIVE

Under the No Action Alternative, the highway would not be rehabilitated. Zion staff would continue routine road maintenance, minor repairs, and snow removal as it has in the past. The road pavement and structural integrity would continue to deteriorate and drainage problems would persist. Guard walls impacted by drainage and inadequate substructure would continue to deteriorate. The No Action Alternative would not correct visitor safety issues associated with road conditions or pullouts. No highway funds would be expended for road reconstruction or improvements; however, road maintenance costs would likely increase to address deteriorating road conditions. Under the No Action Alternative, there would be no improvements to pullouts or a new comfort station.

The No Action Alternative provides a basis for comparison with the Preferred Alternative and the respective environmental consequences. Should the No Action Alternative be selected, the NPS would respond to future needs and conditions without major actions or changes in the present course.

MANAGEMENT PREFERRED ALTERNATIVE

The Preferred Alternative includes site-specific repairs needed to address the identified deficiencies along 9.5 miles of the highway (excluding the 1.1-mile tunnel) and other proposed improvements (PBS&J 2009). Proposed rehabilitation and improvement activities would occur in two phases. The first phase is scheduled for 2010, depending on available funding, and includes rehabilitation of 3.5 miles of roadway on the west side of the tunnel (Figure 4). This section of highway is referred to as the switchbacks and extends from the Virgin River bridge near the intersection with the Zion Canyon Scenic Drive to the west tunnel portal. The estimated construction cost for the first phase of the project is $6.0 million. The second phase is scheduled for 2012, depending on available funding, and includes rehabilitation of 6.0 miles of the roadway from the east portal of the tunnel to the park's eastern boundary.

This stretch of the highway is referred to as the East Entrance section. The estimated construction cost for this phase of the project is $7.0 million.

The following sections describe the proposed roadway rehabilitation and improvements for each phase of the project; however, there are several general characteristics common to actions for both the west and east sides of the tunnel, including:

- No widening or realignments of the roadway off the existing road bench, except minor exceptions for pullouts at Spry Canyon and Keyhole Canyon and the proposed comfort station location
- All sign panels and posts would be replaced
- The posted speed limit would be reduced from 35 mph to 30 mph from the Pine Creek Bridge on the west side of the tunnel to County Line Curve about 3.5 miles east of the tunnel
- Red chips would be used as a construction seal for all new pavement about 1 year following completion of paving
- Edge striping would be used to clearly separate pullout and parking areas from travel lanes
- All roadway improvements incorporate measures to improve travel safety

West Side of the Tunnel—Switchbacks

Highway Design, Geotechnical Work, and Pavement Considerations

A variety of improvements are needed to address the roadway condition in the switchback section of the road (Figure 4). Several of the switchback curves require paving the inside curve and correction of the road slope to improve safety and travel for large vehicles that have difficulty negotiating the tight turns. The Nevada Switchback is located in an active slide area and proposed measures to reduce pavement distress at this location include replacement of the existing subgrade soils with reinforced fill sections. These measures would not provide a permanent solution, but would mitigate the impacts of landslide movement on the road for a longer period of time. Other repair measures at locations throughout the roadway may include subgrade excavation, compaction, and replacement to stabilize areas impacted by infiltration of surface water.

The poor condition of the pavement requires full depth rehabilitation throughout the entire switchback section. The pavement treatment would involve removal of a portion of the existing pavement surface to lower the grade prior to placement of an asphalt overlay. The existing pavement would be graded and/or removed and replaced to address cross-slope and drainage deficiencies. The pavement reclamation material produced through the full depth rehabilitation treatment would provide a stable subgrade material for the placement of a new asphalt pavement.

The rehabilitation treatment would likely raise the grade of the existing pavement surface by +/- 1 inch. The improvements would maintain or increase, wherever possible, the proposed pavement grade at the face of guard walls. Existing asphalt pavement material that is removed would be used to stabilize subexcavation areas or removed from the park. A potential typical cross section of the switchback section of the road following rehabilitation is shown in Figure 5.

FIGURE 4. ZION-MT. CARMEL HIGHWAY PROJECT AREA

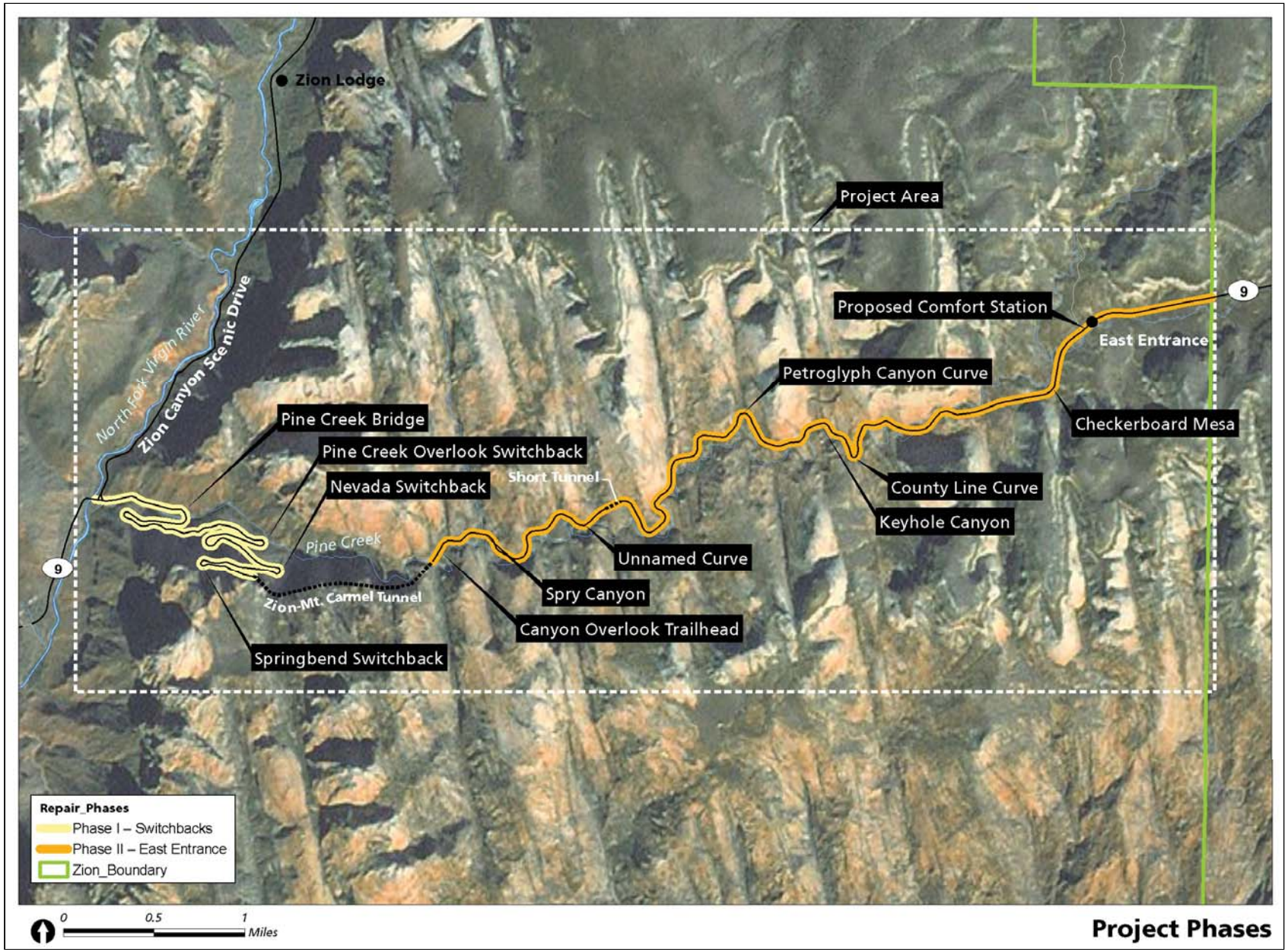
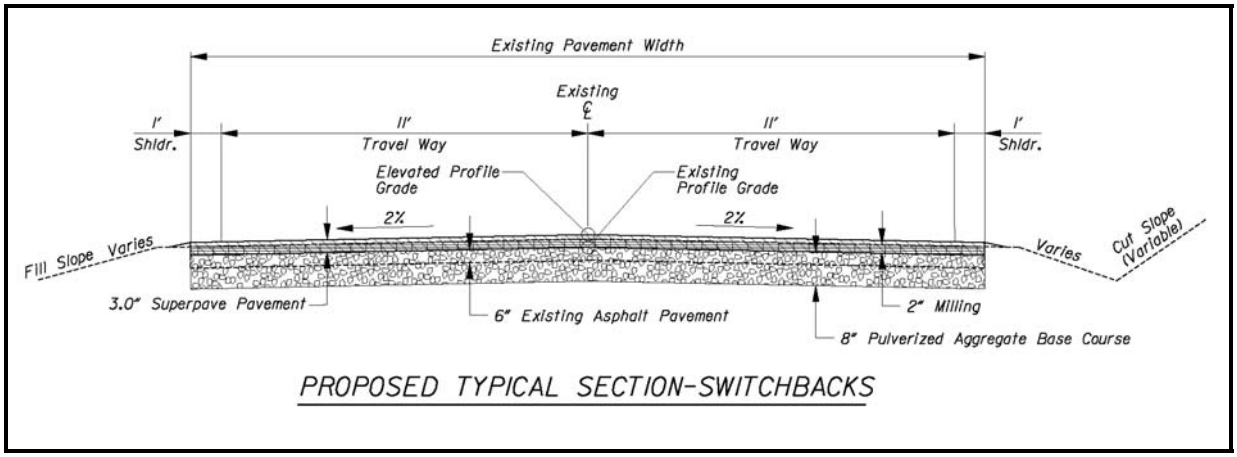


FIGURE 5. PROPOSED TYPICAL SECTION—SWITCHBACKS



Drainage

Storm drainage deficiencies include flow through the roadway subgrade resulting in settling of the pavement and guard walls. Surface drainage is also permeating between the asphalt pavement and guard walls causing erosion damage to the walls. Correcting these issues would require a combination of measures that includes adding new cross-culverts, improving culvert inlets, adding curb and gutter, regrading ditches, and adding underdrains. Culvert and drainage outlets would be improved by adding riprap or other protection measures to dissipate energy and reduce erosion. Ditch protection measures include asphalt paving or riprap to provide permanent erosion control.

The roadside ditch at the Springbend Switchback does not provide adequate drainage of a hillside seep, which results in ponding adjacent to the road as well as surface runoff across the road and through the pavement subgrade. As a result, the pavement and subsoils have settled below the ditch. Improving the drainage at this location would require ditch grading, underdrain placement, and relocation of the existing inlet and storm pipe.

Guard Walls

There are 30 stone masonry guard walls in the switchback section, most of which are in good condition and do not require repair. However, in some locations, guard walls have rotated away from the edge of the road forming gaps between the edge of the pavement and walls, which allows surface water to infiltrate the subgrade and undercut the wall (Figure 6). In addition, guard walls have settled due to substandard subsoil conditions and lack of footings. Two improvement options would be implemented to repair existing damage and prevent future damage to guard walls. A majority of the guard walls would be addressed with general improvements including cross-slope adjustment, surface and subsurface drainage improvement, and guard wall removal/resetting. An additional level of geotechnical improvements including compaction grouting and reinforced fill placement would be considered at selected locations.

General guard wall improvements in areas where periodic patching has resulted in deep asphalt sections require pavement removal and pavement cross-slope correction to reduce pavement thickness, which would result in exposing more of the inside face of guard walls. The exposed face may have discoloration that does not match the existing exposed guard

wall face, but would likely weather to match. Surface and subsurface drainage improvements are proposed throughout the switchbacks to prevent surface runoff from ponding and infiltration through ditches. These improvements include, but are not limited to, cross-slope correction, grading ditches, paving ditches, adding culverts, improving culvert inlets, erosion control at culvert outlets, and adding underdrains. At some locations, existing guard walls have failed. Guard walls in these locations would be dismantled and reset to prevent future damage to pavement and walls. General guard wall improvements are illustrated in Figure 7. Each of these walls would be reconstructed using the original stone in the same pattern and location as the current guard wall to maintain the historic character.

FIGURE 6. ROTATING GUARD WALL

In areas where guard walls have experienced settlement of existing fills from poor drainage or the lack of a footing, compaction grouting of subgrade soils would be used to mitigate the effects of settlement. Where wall heights are less than 10 feet, soils would be removed and replaced with reinforced fill. Removal of existing soils would extend about 1 foot beyond the areas of visible pavement settlement or cracking. Figure 8 illustrates the geotechnical option for guard walls.

Pullouts and Parking

Nineteen locations along the switchback section of the highway are being used as pullouts. These locations include paved and unpaved pullouts on both sides of the road. Planned improvements at pullouts would include paving, slight enlargements to facilitate parking, the addition of large rock or other measures to prevent resource damage from vehicles from parking on vegetation, striping to delineate the road from the pullout, reconfiguration of parking, and reclamation to eliminate existing pullouts that present safety or resource damage concerns. The parking pullout near the Zion Canyon Scenic Drive at the west end of the highway would be reconfigured slightly to address safety concerns with the current parking alignment.

FIGURE 7. GENERAL GUARD WALL IMPROVEMENT OPTIONS

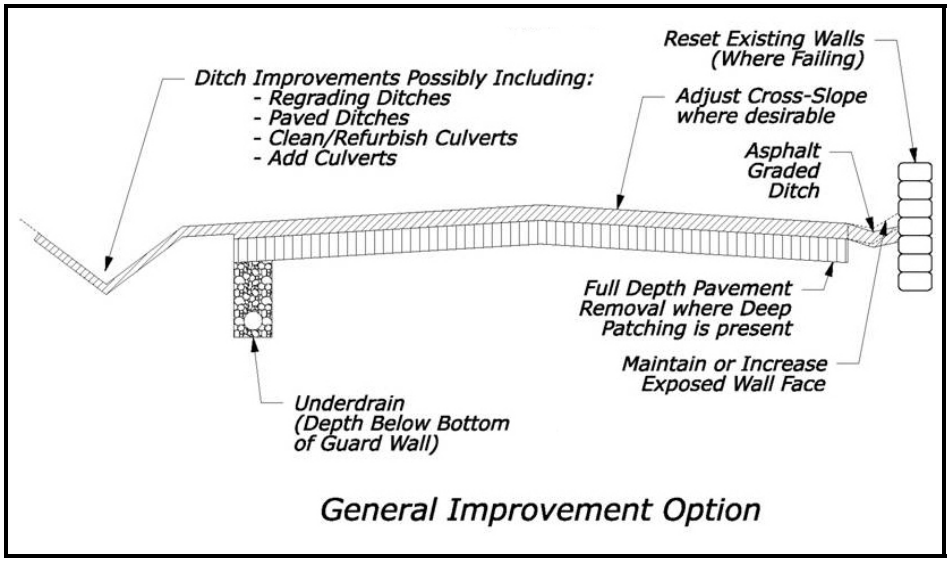
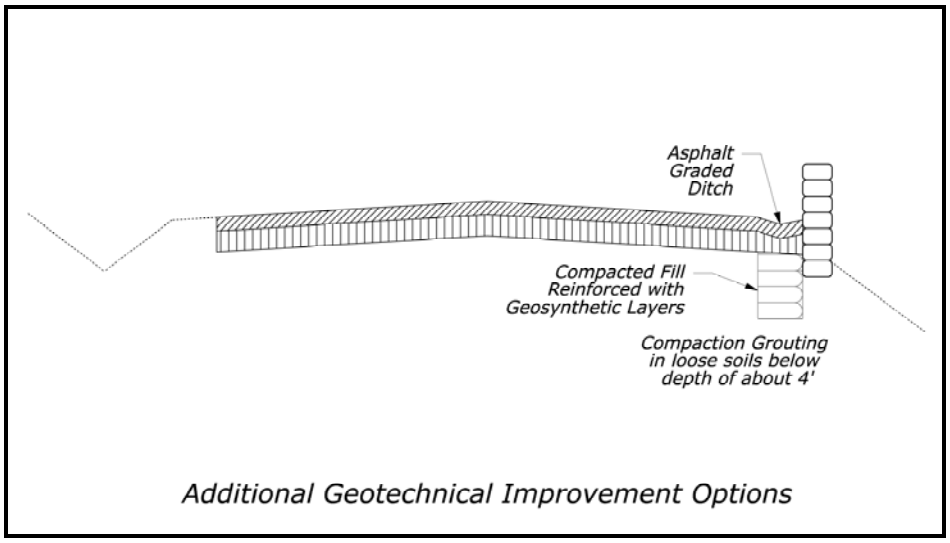


FIGURE 8. ADDITIONAL GUARD WALL GEOTECHNICAL IMPROVEMENT OPTION



East Side of the Tunnel—East Entrance

Highway Design, Geotechnical Work, and Pavement Considerations

Several measures are proposed to address safety concerns associated with three curves on the East Entrance section of the highway because of a history of accidents at these locations. Proposed safety improvements for an Unnamed Curve located west of the short tunnel portal include the addition of a guard wall and correction of the roadway cross-slope (Figure 4). Petroglyph Canyon Curve is also a safety concern because several vehicles have left the roadway and gone over the embankment. A stone guard wall is proposed for the outside of this curve to improve safety (Figure 9). Other measures may include curve widening, curve warning signs and delineators, and possible corrections to the cross-slope of the roadway. County Line Curve is a safety concern because vehicles are using the widened pavement on the inside of the western end as a pullout. This area was not intended as a pullout and does

not meet current sight distance criteria for use as a pullout. To improve safety at this location, the widened pavement area would either be removed to eliminate the pullout or clearly delineated to define the parking location. Other measures would include curve widening and correction of the roadway cross-slope.

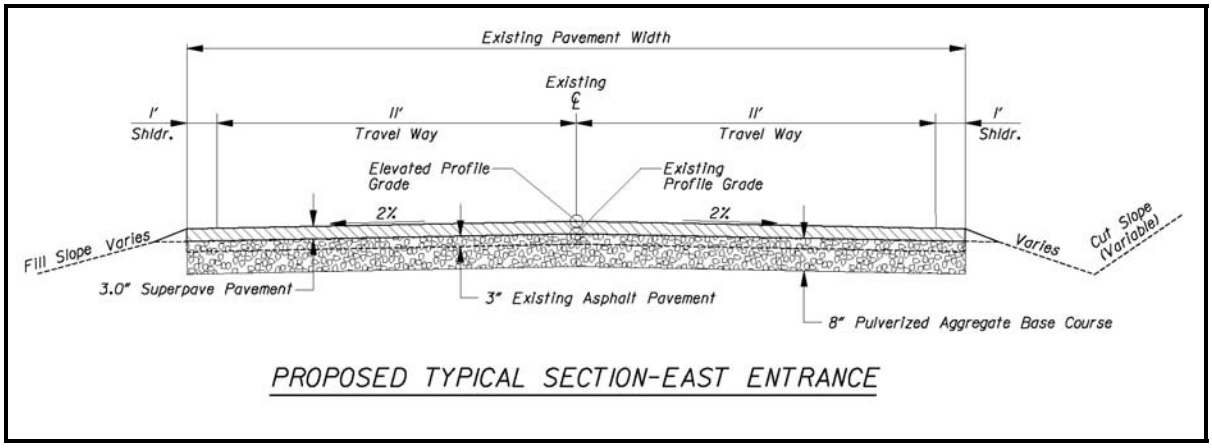
FIGURE 9. PETROGLYPH CANYON CURVE

The pavement along the East Entrance section of the highway is in better condition than the switchback section, but problems include linear and block cracking, pavement edge cracking and deterioration, and potholing. Milling the existing pavement is not needed; therefore, the primary treatment would include pulverization and overlay. Grading the pulverized asphalt near guard walls would be used to ensure that exposure of the guard wall face would be equal to or greater than existing conditions. An approximate 8-inch pulverization depth is anticipated to create a uniform subgrade for the overlay. The overlay would raise the existing ground profile by about 3 inches, which would have a minimal impact on existing ditches (Figure 10). Stone curbing may be installed at several locations including near County Line Curve. Curbing would be similar in composition and quality to existing stone curbing used elsewhere along the highway.

Drainage

The East Entrance section of the highway includes 54 culverts in generally good condition with minimal drainage problems. The east side of County Line Curve is a concern because the south side roadway embankment is eroding. Replacement of the asphalt curb with new stone curbing and construction of a formalized rundown outlet is proposed to reduce erosion. Drainage improvements along the remainder of the East Entrance section of the highway would be identified during final design and are expected to be minimal.

FIGURE 10. PROPOSED TYPICAL SECTION FOR EAST ENTRANCE SECTION OF HIGHWAY



Guard Walls

Sixteen stone masonry guard walls or retaining walls are located in the East Entrance section of the highway. These walls are in good condition and require no repairs. As previously discussed, because of a safety concern at Petroglyph Canyon Curve and the Unnamed Curve (Figure 4), guard walls are proposed to be added along the outside of these curves. The guard walls would be designed to be visually compatible (e.g., similar in scale, massing and materials, texture, and orientation) with the existing guard walls. Proposed stone guard walls would have a concrete core with stone facing on both sides. The height of the proposed guard wall from top of the pavement to top of the stone facing would be about 22 inches (Figure 11).The stone guard walls would meet barrier crashworthiness specifications.

FIGURE 11. PROPOSED GUARD WALL

Pullouts and Parking

Thirty-six pullouts and parking areas are located along the East Entrance section of the highway. Several of these pullouts require improvements to slightly enlarge, pave, or better delineate the pullout from the traffic lane, or removal due to safety concerns. Two pullouts are proposed for more extensive improvements. The Keyhole Canyon parking pullout is being considered for widening to accommodate additional vehicle parking (Figure 4). Enlarging this pullout may require minor additional excavation, fill, and pavement beyond the existing roadway bench, which would be determined during final design. A pullout at Spry Canyon also would be enlarged slightly and paved (Figure 4). Several options for the addition of a comfort station and parking to the existing pullout near the East Entrance Station are being considered. One option includes additional pullout parking on the south side of the highway across from the comfort station with a pedestrian crosswalk. Expansion of the footprint of the existing pullout would be needed to construct the comfort station/parking and widening of the road bench would be needed if a parking pullout is located on the south side of the highway.

Traffic Control and Scheduling

Establishing traffic control measures to implement needed road rehabilitation in a confined area along a popular travel destination is challenging. The highway on the west side of the tunnel is located on a narrow roadway bench through steep rugged terrain with multiple switchbacks. The highway east of the tunnel is less steep, but still follows undulating topography with 61 corners and limited sight distance. Highway access is an important component of the visitor experience at the park and the highway is also an important route for regional traffic to access locations east and west of the park. Cold, snowy, and icy conditions during the winter months limit the construction season to the period between March and October, which coincides with peak visitor traffic. Potential effects on wildlife along the roadway are also a consideration in scheduling construction work. All of these factors contribute to development of a traffic management plan that maintains a reasonable level of visitor access while allowing road improvements to be completed as quickly, safely, and efficiently as possible.

Proposed roadwork on the switchback section of the highway west of the tunnel is generally more extensive than that required for the highway east of the tunnel. Thus, longer traffic delays and more construction time would be required to complete work in the switchback section. Construction work for each phase is expected to be completed in one season.

The highway would remain open during rehabilitation work, subject to temporary traffic delays, night closures, and possible daytime traffic suspensions during work in the switchback section (Table 2). Roadwork would require closure of at least one lane, and at times, both lanes would need to be temporarily closed. Traffic control requirements would be dictated by the type of repairs being conducted and would vary with each of the specific work elements from milling, pulverization, subgrade replacement, guard wall repairs, drainage improvements, paving, and other actions.

TABLE 2. TRAFFIC CONTROL OPTIONS FOR EACH PHASE OF CONSTRUCTION

Traffic Control	West of Tunnel Switchbacks	East of Tunnel—East Entrance
Single-lane alternating one-way travel with traffic delays up to 1 hour between 7 A.M. and 7 P.M.	X	X
Daytime traffic suspension up to 3 hours, Monday to Thursday, between 7 A.M. and 7 P.M.	X	
Night road closure between 9 P.M. and 5 A.M.	X	X

Single-lane alternating one-way travel with traffic delays of up to 1 hour would occur during work on both sides of the tunnel between 7 A.M. and 7 P.M. Flagmen, pilot cars, or signal lights would be used to control traffic through the one-lane section. Because of the additional work needed to complete rehabilitation of the switchback section, traffic suspensions of up to 3 hours may be used from Monday to Thursday.

For traffic delays anticipated to last more than 20 minutes, traffic could be diverted to parking areas. For visitors entering through the South Entrance on the west side of the park, this could include diverting traffic to the Nature Center, Visitor Center, or other locations, including staging areas outside the park. For work on the east side of the tunnel this may include diverting traffic to a temporary parking area located outside of the park boundary. Temporary road closures and openings would be scheduled to occur on the hour or half-hour. Traffic delays would be coordinated with tunnel operations for oversized vehicles, so that visitors would not experience more than one traffic delay. A pilot car could be used to lead traffic from the temporary parking locations through the construction zone.

Night construction activities would occur under both construction phases between 9 P.M. and 5 A.M. The active section of road construction would be completely closed to traffic during night construction and no east/west through traffic would be possible. No construction activity would occur in the dawn (5 A.M. to 7 A.M.) and dusk periods (7 P.M. to 9 P.M.) to avoid impacts to wildlife that are most active during these times of the day. Night closures may vary from these hours as day length changes over the course of the construction season. Single-lane alternating one-way travel with traffic delays would remain in effect during the 5 A.M. to 7 A.M. and 7 P.M. to 9 P.M. and the entire construction period. Additional restrictions on construction activity would be used to protect Mexican spotted owls, California condor, and peregrine falcons as described in the Special Status Species section.

The park would implement a number of steps to provide timely and accurate information to park visitors during roadway rehabilitation to maintain a quality visitor experience. Both the park and the local communities would participate in providing clear and concise information on the status of rehabilitation work and any temporary traffic delays or suspensions. To facilitate visitor planning, the status of roadwork and traffic delays would be advertised two weeks in advance and updated daily. The status of road construction and travel restrictions would be communicated via a number of outlets: the park website, newspaper, radio, at entrance stations, visitor centers, kiosks; through news releases, local newspapers, variable message signs, media outlets, postings in local businesses, and other locations. In addition, park staff could be posted at construction traffic stops to answer visitor questions and provide information during traffic delays.

Staging Areas

Temporary staging areas for equipment and supplies during construction on both the switchback and East Entrance sections of the highway would use available pullouts and parking areas. In addition, the existing disturbed Watchman Trail parking area located in a service area near the South Entrance would be used for staging during construction activities for the switchback section. The construction contractor may lease private land outside of the park for staging during roadwork on the East Entrance section of the highway if sufficient space is not available in parking areas and pullouts. The contractor would be required to comply with all applicable environmental laws and mitigation measures indicated in Table 3, including a survey for weeds prior to establishment of a staging area.

MITIGATION

Mitigation measures to protect natural resources, cultural resources, and other values, as described in Table 3, would apply to the Preferred Alternative.

TABLE 3. MITIGATION MEASURES

Resource Area	Mitigation
General Considerations	Construction zones would be identified with construction fence, silt fence, or some similar material prior to any construction activity. The fencing would define the construction zone and confine activity to the minimum area required for construction. All protection measures would be clearly stated in the construction specifications and workers would be instructed to avoid conducting activities beyond the construction zone. Disturbances would be limited to roadsides, culvert areas, and other areas inside the designated construction limits. No machinery or equipment would access areas outside the construction limits. Construction equipment staging would occur within the roadway for active work areas or at designated pullouts. Off-site equipment and vehicle parking would be limited to designated staging areas. Contractors would be required to properly maintain construction equipment (i.e., mufflers and brakes) to minimize noise. Construction vehicle engines would not be allowed to idle for extended periods of time. Material and equipment hauling would comply with all legal load restrictions. Load restrictions on park roads are identical to state load restrictions with such additional regulations as may be imposed by the Park Superintendent. Water sprinkling would be used as needed to reduce fugitive dust in work zones. Water would be obtained from the park water supply and trucks would be filled at the park filling station. All tools, equipment, barricades, signs, surplus materials, and rubbish would be removed from the project work limits upon project completion.

Resource Area	Mitigation
Vegetation	All disturbed ground would be reclaimed using appropriate best management practices (BMPs) that include planting of native plants. Until the soil is stable and vegetation is established, erosion control measures would be implemented to minimize erosion and prevent sediment from reaching streams. Temporary barriers would be provided to protect existing trees, plants, and root zones. Trees or other plants would not be removed, injured, or destroyed without prior approval. To prevent the introduction of, and minimize the spread of, nonnative vegetation and noxious weeds, the following measures would be implemented during construction: • Soil disturbance would be minimized. • All construction equipment would be pressure washed and/or steam cleaned before entering the park to ensure that all equipment, machinery, rocks, gravel, and other materials are cleaned and weed free. • All haul trucks bringing fill materials from outside the park would be covered to prevent seed transport. • Vehicle and equipment parking would be limited to within construction limits or approved staging areas. • Staging areas outside the park would be surveyed for noxious weeds and treated appropriately prior to use. • All fill, rock, and additional topsoil would be obtained from stockpiles from previous projects or excess material from this project, if possible; and if not possible, then weed-free fill, rock, or additional topsoil would be obtained from sources outside the park. NPS personnel would certify that the source is weed free. • Monitoring and follow-up treatment of exotic vegetation would occur after project activities are completed.
Water Quality and Soils	Erosion control BMPs for drainage and sediment control, as identified and used by the FHWA and NPS, would be implemented to prevent or reduce nonpoint source pollution and minimize soil loss and sedimentation in drainage areas. These practices may include, but are not limited to, silt fencing, filter fabric, temporary sediment ponds, check dams of pea gravel-filled burlap bags or other material, and/or immediate mulching of exposed areas to minimize sedimentation and turbidity impacts as a result of construction activities. The placement and specific measures used will be dictated to a large degree by the steep topography immediately adjacent to the roadway in some portions of the project. Silt fencing fabric would be inspected daily during project work and weekly after project completion, until removed. Accumulated sediments would be removed when the fabric is estimated to be approximately 75% full. Silt removal would be accomplished in such a way as to avoid introduction into any flowing water bodies. Regular site inspections would be conducted to ensure that erosion control measures are properly installed and functioning effectively. The operation of ground-disturbing equipment would be temporarily suspended during large precipitation events to reduce the production of sediment that may be transported to streams. A storm water pollution prevention plan (SWPPP) would be developed and approved by the park and submitted to the Utah Division of Water Quality prior to commencing any near-water activities. All equipment would be maintained in a clean and well-functioning state to avoid or minimize contamination from fluids and fuels. Prior to starting work each day, all machinery would be inspected for leaks (e.g., fuel, oil, and hydraulic fluid) and all necessary repairs would be made before the commencement of work. A hazardous spill plan would be required from the contractor prior to the start of construction stating what actions would be taken in the case of a spill and preventive measures to be implemented. Hazardous spill clean-up materials would be on-site at all times. This measure is designed to avoid/minimize the introduction of chemical contaminants associated with machinery (e.g., fuel, oil, and hydraulic fluid) used in project implementation.

Resource Area	Mitigation
Wildlife	No construction activities would occur from 5 A.M. to 7 A.M. and from 7 P.M. to 9 P.M. to minimize impacts to wildlife that are most active at dawn and dusk. These hours would be adjusted by the park biologist seasonally for varying day lengths. Other construction restrictions for special status species, described below, also would protect wildlife. Lights used for night construction activities would be shielded and directed downward to minimize the areas impacted by the artificial light and to avoid light pollution. The construction contractor would be required to keep all garbage and food waste contained and removed daily from the work site to avoid attracting wildlife into the construction zone. Construction workers would be instructed to remove food scraps and not feed or approach wildlife.
Special Status Species	**Mexican spotted owls and California condors:** No night work or construction activity between 7 P.M. and 7 A.M. would be allowed within the Protected Activity Center (PAC) during the breeding season (March 1 to August 31 or until the owls have fledged as described below). Construction activities with noise levels similar to ongoing maintenance and traffic would be allowed in the PAC between 7 A.M. and 7 P.M. because the owls are likely acclimated to this background level of ambient noise and activity. This would include construction activities such as repair and installation of guard walls and culvert work. Other more intensive construction activities, such as pavement pulverizing, grading, and pavement overlay would be restricted in the PAC within the March 1 to August 31 breeding season. However, park biologists would monitor the nesting progress of the owls and if monitoring indicates that the young owls have fledged prior to August 31, more intensive construction activities would be allowed at that time. No blasting would be allowed within the PAC during the breeding season. No fueling of vehicles would be allowed within the PAC. **Peregrine falcons:** On the section of highway from the west tunnel portal to the Nevada Switchback, the loudest construction activities (milling and pulverizing) would be prohibited from March 1 to May 15 until peregrine nesting is confirmed. If the nesting area is determined active, milling, pulverizing, and pavement overlay from the west tunnel to Nevada Switchback section of the highway would not occur until park biologists confirm that the young peregrines have fledged. This typically occurs by the end of July. Other construction activities similar in noise to existing traffic and maintenance work could occur at any time. If the peregrines are not present in the nesting area near the highway or if the loudest construction activities, such as milling and pulverizing, begin before March 1, then there would be no construction restrictions. **Plants:** Sensitive plant surveys would be conducted prior to disturbance of any suitable habitat. If sensitive species are found, the area would be avoided (if practicable), mitigation measures would be implemented to minimize impacts, or affected plants would be transplanted.

Resource Area	Mitigation
Visitor Experience, Public Health, Safety, and Park Operations	Visitors would be informed in advance of construction activities via a number of outlets including the park website, newspaper, radio, at entrance stations, variable message signs, visitor centers, kiosks, shuttle drivers, and at other nearby national parks. In addition, information on construction would be publicized in news releases, local newspapers, media outlets, postings in local businesses, contacts with tour coach companies, visitor bureaus, chamber of commerce, and travel and tourism related businesses. Traffic delays during construction would be kept to a minimum. For construction on the east side of the tunnel, a maximum delay of 1 hour would occur, except for night work when the road would be closed from about 9 P.M. to 5 A.M. depending on the season. Traffic delays during construction west of the tunnel would be up to 3 hours from 7 A.M. to 7 P.M. Monday to Thursday with the same night closures as the East Entrance work. No construction would occur between 5 A.M. to 7 A.M. and from 7 P.M. to 9 P.M. to protect wildlife, but the highway would remain open, subject to sections of alternating one-way traffic during these periods. Visitors could be directed to parking areas when traffic delays expected to last more than 20 minutes. Pilot cars could then lead traffic through the construction zone when the road reopens. Temporary road closures/openings would be scheduled on the hour and half-hour to help visitors plan their activities. Tunnel operations for oversized vehicles would be coordinated with construction traffic delays so that visitors would be subject to only one traffic delay when traveling the length of the highway. To facilitate visitor planning, the status of roadwork, traffic delays, or suspensions would be posted 2 weeks in advance and updated daily. As much as possible, park staff would be posted at construction traffic stops to answer visitor questions and provide information during traffic delays. The Zion Public Information Officer would coordinate with the contractor on the construction schedule and update visitors and information sources periodically on construction work to inform visitors of project status and access. Provisions for emergency vehicle access through construction zones would be developed.
Cultural Resources	Archeological resources in the vicinity of the project area would be identified and delineated for avoidance prior to project work. New sandstone curbing or guard walls would be designed to be visually compatible (e.g., similar in scale, massing and materials, texture, and orientation) with the existing curbing and guard walls. The park will continue to coordinate with the SHPO throughout the course of the project to protect and mitigate cultural resources affected by the proposed action. Should any archeological resources be uncovered during construction, work would be halted in the area and the park archeologist, SHPO, and appropriate Native American tribes would be contacted for further consultation. Park cultural resources staff would be available during construction to advise or take appropriate actions should any archeological resources be uncovered during construction. In the unlikely event that human remains are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (1990) would be followed. The NPS would ensure that all contractors and subcontractors are informed of the penalties for illegally collecting artifacts or intentionally damaging archeological sites or historic properties. Contractors and subcontractors also would be instructed on procedures to follow in case previously unknown archeological resources are uncovered during construction. Equipment and material staging areas would avoid known archeological resources.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Resurface Existing Road

Minor improvements to the surface of the highway, such as milling and overlay or chip and seal, would not address the underlying structural, geotechnical, and drainage issues contributing to the road problems. Maintenance costs would increase in the long term if structural and drainage deficiencies are not corrected. Resurface options were eliminated because they would not meet the project purpose and need.

Widen the Road to Include a Bike Lane

The existing roadway is too narrow to stripe for a separate bike lane. Widening the road to accommodate a bike lane would require extensive reconstruction of the road bench with large cut and fill slopes, particularly in the switchback section of the road. Road widening would have extensive adverse effects on geologic and biological resources, and the integrity and character of the highway, which is listed on the NRHP. The tunnel would remain an obstacle to bicycle travel even if bike lanes were feasible. This alternative was excluded from further consideration because of the adverse impact to natural, cultural, and scenic resources.

Close Vehicle Access to the Highway

Under this alternative, vehicle access along the highway would be closed from the intersection with Zion Canyon Scenic Drive to the East Entrance Station. A variation of this alternative includes closing the switchback section of the highway to vehicles and improving the East Entrance section of the highway. Pedestrians and bikes would still be allowed to travel closed sections of the roadway. This alternative does not meet the original intent for construction of the highway for the purposes of providing linkage to Bryce Canyon and Grand Canyon National Parks and GMP objectives to: *maintain the Zion-Mt. Carmel Highway, between the south and east entrances of the park, which will remain opened to through (i.e., nonrecreational commuter) traffic* (NPS 2001). In addition, this alternative would not meet the project purpose of providing improved conditions for vehicle access and enjoyment of the park. For these reasons, this alternative was eliminated from further analysis.

Incorporate Reconstruction of Retaining Walls in Project

Approximately 16 existing retaining walls along the switchback section of the highway have erosion, stability, and maintenance deficiencies (AMEC 2005; NPS 2008a). These walls may require minor to moderate repairs at some point in the future, but extensive reconstruction of these walls is beyond the scope and available budget associated with the proposed project. Drainage improvements included in the Preferred Alternative are expected to reduce erosion and stability issues associated with some of the retaining walls. For these reasons, this work was not included as part of the proposed project or considered as a separate alternative.

Redesign the Switchback Section of the Highway to Reduce the Road Footprint

Totally redesigning the road on the west side of the tunnel using viaducts or other measures to reduce the footprint of the highway is beyond the scope and budget available for this project. Major reconstruction of the highway, while potentially providing long-term environmental benefits, would result in substantial short-term adverse effects on the

environment and the NRHP designation of the highway. For these reasons, this alternative was eliminated from further analysis.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The CEQ defines the Environmentally Preferred Alternative as "…the alternative that will promote the national environmental policy as expressed in the National Environmental Policy Act § 101." Section 101 states that, "…it is the continuing responsibility of the Federal Government to:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

2. Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;

3. Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

4. Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment, which supports diversity and variety of individual choice;

5. Achieve a balance between population and resource use, which will permit high standards of living and a wide sharing of life's amenities; and

6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources."

The identification of the "Environmentally Preferred Alternative" was based on an analysis that balances factors such as physical impacts on various aspects of the environment, mitigation measures to deal with impacts, and other factors including the statutory mission of the NPS and the purposes for the project.

While the No Action Alternative would preserve existing conditions, it would not be considered the Environmentally Preferred Alternative because not rehabilitating the highway, repairing damaged road and drainage problems, and implementing other improvements would not meet environmental goals in the same manner as the Preferred Alternative. The No Action Alternative is not the Environmentally Preferred Alternative for the following reasons: 1) not rehabilitating the highway would not meet the stewardship responsibility for protecting park resources (goal 1); 2) it would not improve road safety or protection of environmental and cultural resources (goals 2, 3, and 4); 3) damaged road sections would continue to deteriorate and result in increased maintenance costs (goal 3); and 4) there is a higher likelihood of road failure, which would result in road closure, making it more difficult for visitors and staff to access park facilities (goal 5). Thus, the No Action Alternative does not fully meet the provisions of NEPA Section 101 goals 1, 2, 3, 4, and 5.

The NPS determined that the Environmentally Preferred Alternative should implement the improvements described for the Preferred Alternative because it surpasses the No Action Alternative in realizing the full range of national environmental policy goals as stated in Section 101 of NEPA. The Preferred Alternative would provide the widest range of beneficial uses without degradation, and would reduce risks to health and safety because it would

provide sustainable vehicular access to the facilities and trailheads along the highway. Implementing the Preferred Alternative would best preserve the natural and cultural features along the road because it implements structural improvements while providing long-term protection of environmental and cultural resources (goals 1 and 4). Road improvements would allow for unimpeded access to recreational opportunities and regional access (goals 2, 3, and 5). The Preferred Alternative provides for the reuse of asphalt in place or milled asphalt could be used on other road projects outside of the project area (goal 6).

ALTERNATIVES COMPARISON TABLE

A comparison of the alternatives and the degree to which each alternative fulfills the needs and objectives of the proposed project is summarized in Table 4.

TABLE 4. ALTERNATIVES COMPARISON

No Action Alternative	Preferred Alternative Rehabilitate Zion-Mt. Carmel Road
Under the No Action Alternative, the NPS would not implement road rehabilitation or improvements. Routine road maintenance would continue, but the road pavement and structural integrity would continue to deteriorate. There would be no improvements to surface pavement, subgrade, drainage, or pullouts. New guard walls, a comfort station, and roadway signs would not be installed.	Under the Preferred Alternative, the NPS would implement the rehabilitation repairs and improvements necessary to restore the condition of the highway. The proposed improvements would repair damaged areas of road subgrade, correct cross-slope and drainage issues, repave the entire roadway, protect existing guard walls and install new guard walls, improve or eliminate pullouts to improve visitor safety, add a comfort station near the East Entrance, replace roadway signs, and lower the speed limit for much of the highway from 35 mph to 30 mph.
Meets Objectives?	
The No Action Alternative does not fulfill the project objectives. Visitor enjoyment and safety concerns would not be addressed because problems associated with the condition of the road surface, slope, drainage, guard walls, and pullouts would not be addressed. The efficiency of park operations would not be improved and maintenance requirements and costs would increase. Park natural and cultural resources and the scenic quality of the road would be compromised by deteriorating road conditions, poor drainage, erosion, and damage to historic cultural features.	The Preferred Alternative fulfills the project objectives by implementing needed road repairs and improvements. Visitor enjoyment and safety would benefit from measures to improve the condition of the roadway, pullouts, parking, and the addition of a comfort station. Road and facility upgrades would make travel by vehicles easier and safer. The efficiency and cost of park operations would improve from better road conditions and reduced maintenance requirements. Park natural and cultural resources would be protected by drainage improvements, reconstruction of several guard walls, and other structural repairs that reduce the potential for deterioration of historic features. Road repairs and improvements would be implemented in a manner to minimize adverse effects on plants and wildlife and to protect cultural resource values. The Preferred Alternative would meet project objectives.

IMPACT SUMMARY

A summary of potential environmental effects for the alternatives is presented in Table 5.

TABLE 5. IMPACT SUMMARY TABLE

Impact Topic	No Action Alternative	Preferred Alternative Rehabilitate Zion-Mt. Carmel Road
Geology	The No Action Alternative would not correct road drainage problems, which would lead to continued slumping in the switchbacks west of the tunnel and a local long-term minor adverse effect on geologic resources.	The Preferred Alternative would have a beneficial effect on geologic features and processes by improving drainage and reducing the potential for slumping in the switchback section of the highway.
Soils	The No Action Alternative would have local long-term minor adverse effects on soils from deterioration of the roadway and drainage problems that generate erosion.	The Preferred Alternative would have local short-term minor adverse effects on soil resources during construction from disturbances during installation of drainage improvements, guard wall repairs and construction, pullout improvements, and other incidental soil disturbances adjacent to the highway. Proposed rehabilitation would have a long-term benefit on soils by stabilizing the road surface and correcting drainage deficiencies that cause erosion.
Vegetation	The No Action Alternative would have local long-term negligible adverse effects on vegetation adjacent to the highway from erosion and drainage problems.	The Preferred Alternative would have local long-term minor adverse effects on vegetation from road rehabilitation disturbances that are estimated to affect less than 0.5 acre of vegetation. Weed establishment in areas of disturbed soil is also possible, but would be minimized with weed control practices. Improvements to drainage and reductions in erosion would have a long-term beneficial effect on vegetation.
Wildlife	The No Action Alternative would have no new impacts on wildlife.	The additional noise and disturbance during construction would result in local short-term minor adverse effects on wildlife, with long-term benefits associated with a reduction in speed limit. Because activities would occur primarily within the footprint of existing facilities, there would be a negligible effect to wildlife habitat. Effects to fish from possible impacts to stream water quality during construction would be short-term, negligible, and adverse, with long-term benefits from water quality improvements.

Impact Topic	No Action Alternative	Preferred Alternative Rehabilitate Zion-Mt. Carmel Road
Special Status Species	The No Action Alternative would have no new impacts on special status species.	The additional noise and disturbance during construction would result in impacts on several special status animal species. The Preferred Alternative may affect, but is unlikely to adversely affect, Mexican spotted owl and California condor. Mitigation measures would be implemented to restrict the timing of the loudest construction activities near Mexican spotted owl habitat until after young owls have fledged. These measures would also reduce potential impacts to California condors, which are only occasional visitors to the area. Impacts to flannelmouth sucker, Virgin River spinedace, Arizona toad, common chuckwalla, western banded gecko, fringed myotis, Townsend's big-eared bat, and mountain lion would be local, short-term, negligible to minor, and adverse from the temporary disturbances and activities during construction. Long-term beneficial effect on fish and aquatic species would occur from correcting drainage deficiencies and deteriorating road conditions that generate erosion. No adverse impacts on sensitive plant species is anticipated because of the limited area of disturbance and lack of suitable habitat, and there are no threatened or endangered plant species in the project area.
Hydrology and Water Quality	The No Action Alternative would result in local long-term negligible adverse effects on water resources from ongoing drainage and erosion problems associated with the deteriorating condition of the highway.	The Preferred Alternative would have local short-term minor adverse effects on hydrology and water quality during construction from surface disturbances that may generate erosion and increased sediment runoff, but long-term effects would be beneficial as a result of improvements in drainage and the condition of the road surface. There would be a negligible increase in impervious area from paving several unpaved pullouts or minor expansion of existing pullouts.
Historic Structures	Structural and drainage deficiencies that undercut or weaken guard walls, retaining walls, culvert headwalls, and other historical features, if left untreated, would result in local long-term minor adverse impacts to historic structures.	Proposed rehabilitation work would require repairs of several historic structures as well as the introduction of new features such as guard walls and curbing. The repair or rebuilding of existing guard walls, installation of stone curbing, and culvert headwall repairs would be implemented in a manner to maintain the historic integrity of the design characteristics and craftsmanship, and would be compatible with the original method of construction. As a result, the effect on existing historic highway structures would be local, long-term, minor, and adverse. Measures to correct roadway structural and drainage deficiencies would have a long-term beneficial effect on existing guard walls, retaining walls, and other historic features that require protective or rehabilitation measures.
Archeological Resources	Archeological resources would not be affected under the No Action Alternative.	Archeological resources would not be affected under the Preferred Alternative.

Impact Topic	No Action Alternative	Preferred Alternative Rehabilitate Zion-Mt. Carmel Road
Cultural Landscape	There would be adverse impacts to the potential cultural landscape (historic structure element) under the No Action Alternative from deterioration of guard walls, retaining walls, and other features currently being damaged as a result of poor drainage and erosion. Deterioration of highway structural features also diminishes the aesthetic quality of the road. If left untreated, the effects on the cultural landscape would be local, long-term, minor to moderate, and adverse.	There would be new impacts on the cultural landscape (historic structure element) under the Preferred Alternative. Measures to correct roadway structural and drainage deficiencies would result in local long-term minor adverse impacts on landscape elements, but would also have a long-term beneficial effect on existing guard walls, retaining walls, and other historic features that receive protective or rehabilitative measures. Proposed improvements would maintain the aesthetic quality, scenic view points, travel pattern, and natural features along the highway and would not deter from the potential of the highway to be nominated and included on the NRHP as a cultural landscape.
Visitor Experience and Recreational Resources	The No Action Alternative would have local long-term minor adverse effects on the visitor experience and recreation resources from ongoing deterioration of the roadway and structural features that contribute to the quality of the visitor experience and that provide access to recreation resources. Although the highway would remain open to visitor access, as roadway conditions deteriorate, periodic maintenance projects would require traffic delays at random times and locations, which would inconvenience visitors.	Traffic delays and suspensions would inconvenience visitors traveling along the highway during construction. In response to construction activities, some visitors may avoid the park, visit other portions of the park, or choose alternate routes for regional travel connections when traffic is suspended along the highway. The park would inform visitors in advance of construction via a number of sources so they can best plan their schedule and activities and minimize impacts. The effect on visitor experience and recreation resources would be short-term, moderate, and adverse at the local, park-wide, and regional level during construction. The Preferred Alternative would provide long-term beneficial effects on the quality of the visitor experience following construction by improving the quality and condition of the highway.
Soundscape	The No Action Alternative would have no effect on the existing soundscape along the highway.	The Preferred Alternative would result in local short-term minor adverse effects on the soundscape in the vicinity of the highway from construction activity and traffic, but would have no long-term adverse effects. A slight reduction in noise levels is possible along the highway from reducing the posted speed limit from 35 mph to 30 mph from the Pine Creek Bridge to County Line Curve.

Impact Topic	No Action Alternative	Preferred Alternative Rehabilitate Zion-Mt. Carmel Road
Public Health, Safety, and Park Operations	The No Action Alternative would result in local long-term minor adverse effects on public health, safety, and park operations by not addressing known safety issues and needed road repairs. The potential for accidents would be similar to existing conditions and may increase as the road continues to deteriorate. The need for maintenance would increase.	Proposed rehabilitation and improvements would address safety and road maintenance concerns associated with the highway. Improvements to road cross-slope, narrow switchback corners, roadway pavement, and drainage would improve safety and driving conditions and reduce maintenance requirements. Construction work and traffic delays would cause a disruption in normal traffic patterns, parking, and visitor activities in the park, which would place a greater demand on park staff. The Preferred Alternative would result in local and park-wide short-term moderate adverse effects on park operations. Completion of proposed roadway improvements would result in local long-term beneficial effects on public health, safety, and park operations by improvements to the structural features of the road and safety measures that reduce the potential for accidents.
Socioeconomics	The No Action Alternative would have regional long-term minor adverse effects on the economy from increased road maintenance costs and potential adverse effects on visitor attendance as the road deteriorates.	The Preferred Alternative would have regional short-term beneficial effects on the economy from construction-related spending and employment. Traffic delays would deter some visitors from coming to the park, resulting in regional short-term minor adverse impacts. Long-term socioeconomic effects would be beneficial to regional businesses from improvements to the quality of the visitor experience along the highway.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This section provides a description of the resources potentially impacted by the alternatives and the likely environmental consequences. It is organized by impact topics that were derived from internal park and external public scoping. Impacts are evaluated based on context, duration, intensity, and whether they are direct, indirect, or cumulative. NPS policy also requires an evaluation of potential impairment of park resources and the potential for generating unacceptable levels of impact. More detailed information on resources in Zion may be found in the General Management Plan (2001).

GENERAL METHODS

This section contains the environmental impacts, including direct and indirect effects, and their significance for each alternative. The analysis is based on the assumption that the mitigation measures identified in the "Mitigation" section of this EA would be implemented for the Preferred Alternative. Overall, the NPS based these impact analyses and conclusions on the review of existing literature and park studies, information provided by experts within the park, other agencies, professional judgment and park staff insights, and public input.

The following terms are used in the discussion of environmental consequences to assess the impact intensity threshold and the nature of impacts associated with each alternative:

Type: Impacts can be beneficial or adverse.

Context: Context is the setting within which an impact would occur, such as local (in the project area along the highway), park-wide (in Zion), or regional (in Washington and Kane counties and southwest Utah).

Impact Intensity: Impact intensity is defined individually for each impact topic. There may be no impact, or impacts may be negligible, minor, moderate, or major.

Duration: Duration of impact is analyzed independently for each resource because impact duration is dependent on the resource being analyzed. Depending on the resource, impacts may last for the construction period, a single year or growing season, or longer. For purposes of this analysis, impact duration is described as short-term or long-term.

Direct and Indirect Impacts: Effects can be direct, indirect, or cumulative. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later or farther away, but are still reasonably foreseeable. Direct and indirect impacts are considered in this analysis, but are not specified in the narratives. Cumulative effects are discussed on page 39.

Threshold for Impact Analysis: The duration and intensity of effects vary by resource. Therefore, the definitions for each impact topic are described separately. These definitions

were formulated through the review of existing laws, policies, and guidelines; and with assistance from park staff, regional NPS, and Washington office NPS specialists. Impact intensity thresholds for negligible, minor, moderate, and major adverse effects are defined in a table for each resource topic.

CUMULATIVE EFFECTS

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. The CEQ regulations that implement NEPA require assessment of cumulative impacts in the decision-making process for federal projects.

Methods for Assessing Cumulative Effects

Cumulative impacts were determined by combining the impacts of the Preferred and No Action alternatives with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects near Zion or the surrounding region that might contribute to cumulative impacts. The geographic scope of the analysis includes actions in the Zion-Mt. Carmel Highway corridor as well as other actions in the park or surrounding lands where overlapping resource impacts are possible. The temporal scope includes projects within a range of approximately 10 years.

Past, present, and reasonably foreseeable actions were then assessed in conjunction with the impacts of the alternatives to determine if they would have any added adverse or beneficial effects on a particular natural resource, park operation, or visitor use. The impact of reasonably foreseeable actions would vary for each of the resources. Cumulative effects are considered for each alternative and are presented in the environmental consequences discussion for each impact topic.

Past Actions

Past actions include activities that influenced and affected the current conditions of the environment near the project area. The highway was completed in 1930 and has undergone periodic maintenance, repairs, and overlays since then. In 2007, several road rehabilitation measures were implemented near the east and west tunnel portals. Improvements on the east side of the tunnel included slurry sealing the road surface, scaling rock slopes, reconfiguring two parking areas, creating a painted center median with rumble strips, relocating a cross walk and construction of a sidewalk from a parking area to the Canyon Overlook Trail, eliminating three informal pullouts and reconfiguring one pullout into a slow vehicle passing lane, implementing erosion control measures, and replacing and relocating the ranger kiosks. On the west side of the tunnel, entrance rumble strips were added to the existing painted center median and the ranger kiosk was replaced. The Zion Canyon park road from the South Entrance to the Temple of Sinawava was rehabilitated in 2005.

Current and Future Actions

The park plans to conduct prescribed burning on about 300 acres near the East Entrance in 2009. If successively implemented, this activity would not overlap planned highway rehabilitation east of the tunnel scheduled for 2012 or work on the west side of the tunnel in 2010. No other reasonably foreseeable actions were identified within the immediate project area that would potentially contribute to cumulative effects.

In the broader geographic area within Zion, several actions are likely to occur in the future. Zion recently completed a draft Transportation System Technical Analysis (NPS 2008c) to evaluate the Zion Canyon shuttle system that was implemented in 2000. Although the shuttle program has been very successful, the technical analysis was conducted to determine if there are opportunities to improve operations and efficiency. The analysis includes a number of recommendations that may result in improvements to parking, reducing traffic congestion near the South Entrance and in Springdale, establishing better regional transportation connections to Zion, enhancing visitor communication, and other financial and efficiency measures. The park is also proposing to rehabilitate, restore, and resurface about 9.8 miles of Kolob Terrace Road located in the northern portion of the park. These road improvements would include geotechnical and drainage improvements. This work is currently scheduled to occur in 2014.

Expected regional population growth in Kane, Washington, and Iron counties may lead to additional park visitation and greater traffic volumes on the highway. The Utah Department of Transportation (2008) recently completed a transportation study for eastern Washington County, which included a number of recommendations for improvements to State Route 9 from Hurricane to the park boundary. The recommendations include a variety of measures to improve safety and traffic flow including intersection improvements; new turn lanes; widened shoulders; the addition of climbing lanes, guardrails, pedestrian walkways; and other measures. Implementation of these projects will depend on available funding, but it is likely that some of these projects would be implemented in the next 10 years.

IMPAIRMENT OF ZION NATIONAL PARK RESOURCES OR VALUES

In addition to determining the environmental consequences of the alternatives, NPS *Management Policies 2006* and Director's Order – 12 require an analysis of potential effects to determine if actions would impair park resources or cause unacceptable impacts. The fundamental purpose of the national park system established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park and monument resources and values. However, the laws do give NPS management discretion to allow impact to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given NPS management discretion to allow certain impacts within parks, that discretion is limited by statutory requirements that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise.

The prohibited impairment is an impact that would, in the professional judgment of the responsible NPS manager, harm the integrity of park resources or values, including opportunities that would otherwise be present for the enjoyment of those resources or

values. An impact to any park resource or value may constitute an impairment. However, an impact would more likely constitute impairment to the extent it affects a resource or value whose conservation is:

- Necessary to fulfill specific park purposes identified in the establishment legislation or proclamation of the park;
- Key to the natural and cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in Zion. The discussion of environmental consequences includes a determination on impairment in the conclusion statement of the appropriate impact topics for each alternative. Impairment statements are not required for visitor experience/recreational values, socioeconomic values, or park operations.

UNACCEPTABLE IMPACTS

The impact threshold at which impairment occurs is not always readily apparent. Therefore, the NPS applies a standard that offers greater assurance that impairment will not occur. The NPS does this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable.

For the purposes of these policies, unacceptable impacts are impacts that, individually or cumulatively, would:

- be inconsistent with a park's purposes or values, or impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process, or
- create an unsafe or unhealthful environment for visitors or employees, or
- diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- unreasonably interfere with:
    - park programs or activities, or
    - an appropriate use, or
    - the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park, or
    - NPS concessioner or contractor operations or services.

A determination on unacceptable impacts is made in the conclusion statement of each impact topic for each alternative in the environmental consequences discussion.

IMPACTS TO CULTURAL RESOURCES AND SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

For purposes of the NEPA process, cultural resources are considered under Section 106 of the National Historic Preservation Act (NHPA, 1966, as amended), and specifically its implementing regulations under 36 CFR Part 800. Section 106 requires federal agencies to consider the effects of an undertaking on historic properties and provides a process under which to implement Section 106. In this case, the NPS has determined that improvements to the Zion-Mt. Carmel Highway have the potential to adversely affect cultural resources and is using the EA as an assessment of effects for compliance with Section 106.

In this EA, impacts to cultural resources are described in terms of type, context, duration, and intensity, as described above, which is consistent with the regulations of the Council on Environmental Quality (CEQ) that implement the NEPA. These impact analyses are intended, however, to comply with the requirements of both NEPA and Section 106 of the NHPA. In accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 of the NHPA (36 CFR Part 800, Protection of Historic Properties), impacts to archeological and cultural resources were identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the National Register of Historic Places; (3) applying the criteria of adverse effect on affected cultural resources either listed in or eligible to be listed in the National Register; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

Under the Advisory Council's regulations, a determination of either adverse effect or no adverse effect must also be made for affected National Register-eligible cultural resources. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register (e.g., diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association). Adverse effects also include reasonably foreseeable effects caused by the Preferred Alternative that would occur later in time, be farther removed in distance ,or be cumulative (36 CFR Part 800.5, Assessment of Adverse Effects). A determination of no adverse effect means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the National Register.

CEQ regulations and the National Park Service's Conservation Planning, Environmental Impact Analysis and Decision-making (Director's Order #12) also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact (e.g., reducing the intensity of an impact from major to moderate or minor). Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect, as defined by Section 106, is similarly reduced. Although adverse effects under Section 106 may be mitigated, the effect remains adverse. The park will coordinate with the SHPO to address mitigation measures for the Preferred Alternative.

A Section 106 summary is included in the impact analysis sections for historic structures, archeological resources, and the cultural landscape under the Preferred Alternative. The Section 106 summary is intended to meet the requirements of Section 106 and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural

resources, based upon the criteria of effect and adverse effect found in the Advisory Council's regulations.

GEOLOGY

Affected Environment

The exposed rock formations within Zion are part of a thick sequence of sedimentary rock units known as the Grand Staircase (Yeh and Associates 2008). The formations exposed in Zion Canyon were deposited as sediment in several different environments, including shallow seas, streams, and sand dunes during long periods of desert, which resulted in alternating layers of limestone, siltstone, claystone, and sandstone. Subsequent uplift and erosion led to many of the outstanding geologic formations in the park. The geomorphologic history of the switchback section of the highway is complex and includes areas of bedrock outcrop interspersed with masses of relatively young and older landslide deposits (Doelling et al. 2002). The stair-step topography created by the landslide deposits was used by the road designers in the original layout of the road. Portions of the switchback section that include the previously active slides that are affected by ground water levels and road drainage are prone to new slides. The highway east of the tunnel is located in rolling terrain with large expanses of sandstone outcrops. Much of the road is subject to rockfall hazards, and this will remain unaltered under either of the alternatives.

Impact Intensity Threshold

Potential impacts to geologic resources were based on professional judgment and the expected degree of disturbance for the alternative. The threshold for the intensity of an impact on geology is defined in Table 6.

TABLE 6. GEOLOGY IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	An action that would result in a change in a geologic feature or process, but the change would be so small that it would not be of any measurable or perceptible consequence.
Minor	An action that would result in a change in a geologic feature or process, but the change would be small, localized, and of little consequence.
Moderate	An action that would result in a noticeable change in a geologic feature or process; the change would be measurable and of consequence.
Major	An action that would result in an extensive change in a geologic feature or process; the change would be measurable and result in a severe adverse impact.

All impacts to geologic resources are long term

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts of the Alternative. Under the No Action Alternative, normal geologic processes and erosion would continue to occur. If roadway drainage in the switchback section west of the tunnel is not addressed, these processes and erosion would lead to increased potential for accelerated slumping in an active landslide area. This would result in local long-term minor adverse effects to geologic resources.

Cumulative Impacts. Original construction of the highway required substantial earthwork to construct the switchbacks on the steep side slopes located on the west side of

the tunnel. The boring of the tunnel and short tunnel required extensive excavation into sandstone geologic features. Construction of the highway east of the tunnel also required substantial earthwork and modifications to natural geologic features. In 2007, rock scaling on the east portal of the tunnel was used to reduce the rockfall hazard. Rehabilitation of the Kolob Terrace Road would have limited disturbance to geologic resources. The impacts of reasonably foreseeable future activities are expected to be far less than those for initial construction. Past, present, and reasonably foreseeable future projects would have a local minor adverse effect on geologic resources. Those impacts, in combination with the local minor adverse effects of the No Action Alternative, would result in local minor adverse cumulative effects.

Conclusion. The No Action Alternative would not correct road drainage problems, which would lead to continued slumping in the switchbacks west of the tunnel and a local long-term minor adverse effect on geologic resources. Cumulative effects would be local, minor, and adverse. Because there would be no major adverse or unacceptable impacts to geology, there would be no impairment of park resources or values.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. Proposed rehabilitation and improvements to the highway would not impact geologic features. No blasting, rock scaling, or other operations are planned that would disturb rock formations or geologic processes. Planned drainage improvements in the switchback section of the highway would reduce the potential for slumping in an area that has experienced previous landslide activity. The improvements may not eliminate slumping on a geologic time scale, but are expected to provide additional stability to the roadway and reduce maintenance and repairs during the design life of the project. The Preferred Alternative would provide a benefit to geologic resources by reducing saturated soil conditions adjacent to the highway and reducing the potential for slumping and slope instability.

Cumulative Impacts. Original construction of the highway required substantial earthwork to construct the switchbacks on the steep side slopes located on the west side of the tunnel. The boring of the tunnel and short tunnel required extensive excavation into sandstone geologic features. Construction of the highway east of the tunnel also required substantial earthwork and modifications to natural geologic features. In 2007, rock scaling on the east portal of the tunnel was used to reduce the rockfall hazard. Rehabilitation of the Kolob Terrace Road would have limited disturbance to geologic resources. The impacts of reasonably foreseeable future activities are expected to be far less than those for initial construction. Past, present, and reasonably foreseeable future projects would have a local minor adverse effect on geologic resources. Those impacts, in combination with the local beneficial effects of the Preferred Alternative, would result in beneficial cumulative effects.

Conclusion. The Preferred Alternative would have a beneficial effect on geologic features and processes by improving drainage and reducing the potential for slumping in the switchback section of the highway. Cumulative effects would be local and beneficial. Because there would be no major adverse or unacceptable impacts to geology, there would be no impairment of park resources or values.

SOILS

Affected Environment

Most of the soils in the park and in the project area are young, very well drained, easily eroded, and low in fertility (NRCS 2009). Rock and stony rock lands are present in half of the 36 soil complexes that occur in the park and are common along the highway. More than 80 percent of the soils have low productivity or high erosion potential. In slickrock areas bordering the highway, soil is limited or occurs only in small pockets. Soils are often shallow and contain an abundance of gravel and rock. Although soils on steep slopes are often little more than ground bedrock with very little soil development and a large proportion of gravel and boulders, the soils can still support a moderate density and diversity of plants. The deepest soils are typically confined to stream terraces and floodplains, as well as isolated pockets on some of the flatter upland terraces. There are few terraces or deep productive soils in the project area.

Zion also contains notable amounts of biological soil crusts where the soil surface is bound together by a community of algae, fungi, lichen, and other microorganisms. Detailed surveys of the distribution of biological soil crusts in Zion are not available; however, these crusts are typically associated with open canopies and sandy soil usually found in pinyon/juniper woodlands and desert-shrub communities. The potential for biological soils crusts in the project area is limited because of the large amounts of rock outcrop, steep slopes, and most of the cut and fill slopes adjacent to the highway have been previously disturbed.

Erosion is a naturally occurring process that helped form Zion, but accelerated areas of soil erosion are occurring in some locations along the highway from deficiencies in road drainage, deteriorating road shoulders and fill slopes, and unpaved pullouts.

Impact Intensity Threshold

Available information on potentially impacted soils in the project area was compiled. Potential impacts from the alternatives were based on professional judgment and experience with similar actions. The threshold of change for the intensity of an impact on soils is defined in Table 7.

TABLE 7. SOIL IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	The effects on soils would be below or at a very low level of detection. Any effects on productivity or erosion potential would be slight.
Minor	An action's effects on soils would be detectable. The effects would change a soil's profile in a relatively small area, but would not appreciably increase the potential for erosion of additional soil. If mitigation were needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.
Moderate	An action would result in a change in quantity or alteration of the topsoil, overall biological productivity, or the potential for erosion to remove small quantities of soil. Changes to localized ecological processes would be limited. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.
Major	An action would result in a change in the potential for erosion to remove large quantities of soil or in alterations to topsoil and overall biological productivity in a relatively large area. Key ecological processes would be altered, and landscape-level changes would be expected. Mitigation measures to offset adverse effects would be necessary, extensive, and their success could not be guaranteed.

Short-term impact—recovers in less than 3 years
Long-term impact—takes more than 3 years to recover

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts of the Alternative. No disturbance to soil resources would occur because there would be no construction-related actions. Deterioration of the pavement edges and erosion of the road shoulder or fill slopes in some locations would continue, which would result in soil loss. Areas of poor drainage that cause erosion of fill slopes or of the subgrade below the roadway would not be corrected. Although the productivity of soils adjacent to the roadway is generally poor, these continued impacts to soils would be local, long-term, minor, and adverse.

Cumulative Impacts. Past actions, such as road construction, repairs, and maintenance, have impacted soil resources from excavation, erosion, and a loss in soil productivity. Planned future prescribed burning on the east side of the park would result in a temporary increase in soil erosion, but long-term effects would be beneficial. Rehabilitation of the Kolob Terrace Road would result in temporary disturbances to soils similar to those expected for the Preferred Alternative. Past, present, and reasonably foreseeable future projects would have a local long-term minor adverse effect on soil resources. Those impacts, in combination with the local long-term minor adverse impacts of the No Action Alternative, would result in local long-term minor adverse cumulative effects.

Conclusion. The No Action Alternative would have local long-term minor adverse effects on soils from deterioration of the roadway and drainage problems that generate erosion. Cumulative effects would be local, long-term, minor, and adverse. Because there would be no major adverse or unacceptable impacts to soils, there would be no impairment of park resources or values.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. Roadway rehabilitation activities such as milling, pulverizing, excavating, grading, and paving would occur primarily within the areas of existing disturbance with only incidental impacts to adjacent shoulders. Drainage

and culvert improvements and pullout enlargements would result in disturbances to soils in ditches and embankments. Enlargement of an existing pullout to construct a new comfort station would result in the disturbance and loss of soil resources. Exposed soil material during construction would be subject to erosion until stabilized or revegetated. Impacts to soils during construction would be local, short-term, minor, and adverse. Proposed drainage improvements and correction of deteriorating road pavement would reduce the potential for erosion and soil loss. The Preferred Alternative would result in a local long-term beneficial effect on soil resources by repairing existing road conditions that currently generate erosion. Planned use of temporary and permanent erosion control BMPs would reduce the potential for short- and long-term erosion and soil loss.

Cumulative Impacts. Past actions, such as road construction, repairs, and maintenance, have impacted soil resources from excavation, erosion, and loss in soil productivity. Planned future prescribed burning on the east side of the park would result in a temporary minor increase in soil erosion, but long-term effects would be beneficial. Rehabilitation of the Kolob Terrace Road would result in temporary disturbances to soils similar to those expected for the Preferred Alternative. Past, present, and reasonably foreseeable future projects would have a local long-term minor adverse effect on soil resources. Those impacts, in combination with the local long-term beneficial effects of the Preferred Alternative, would result in local long-term beneficial cumulative effects.

Conclusion. The Preferred Alternative would have local short-term minor adverse effects on soil resources during construction from disturbances during installation of drainage improvements, guard wall repairs and construction, pullout improvements, and other incidental soil disturbances adjacent to the road. Proposed rehabilitation would have a long-term benefit on soils by stabilizing the road surface and correcting drainage deficiencies that cause erosion. Cumulative effects would be local, long-term, and beneficial. Because there would be no major adverse or unacceptable impacts to soils, there would be no impairment of park resources or values.

VEGETATION

Affected Environment

Vegetation communities in Zion range from the northern Mojave Desert and Great Basin plant communities to southern Rocky Mountain plant communities (NPS 2004). Vegetation communities at the elevations present in the project area (4,100 to 5,700 feet) includes woodlands, mixed shrubs, and slickrock with scattered pockets of vegetation. On the west side of the tunnel, vegetation is comprised primarily of low density stands of pinyon/juniper woodlands and areas of Fremont cottonwood, velvet ash, big sagebrush, and Gambel oak. The eastern portion of the highway is located in a landscape dominated by sandstone slickrock outcrops, bare soil, and stone formations. Vegetation in these rocky areas is typically sparse, though the variety of species is often great and includes a number of endemic species. Ponderosa pine is common along the roadside as are shrubs, such as greenleaf Manzanita, littleleaf mahogany, and rabbit brush. Fremont cottonwood, boxelder, Goodings willow, velvet ash seepwillow, and Coyote willow are common riparian species along Pine Creek, which parallels much of the highway.

Roadside fill material on shoulders and cut and fill slopes is often sparsely vegetated and frequently supports nonnative weed species. Weeds near the East Entrance include Russian thistle, cheatgrass, and ripgut brome. Yellow starthistle is found just outside the East Entrance. Weed species, such as kochia, Russian thistle, silverleaf nightshade, and cheatgrass are common in disturbed areas at the proposed Watchman staging area.

Impact Intensity Threshold

Predictions about impacts were based on the expected disturbance to vegetation communities, and professional judgment and experience with previous projects. The thresholds of change for the intensity of an impact on vegetation are defined in Table 8.

TABLE 8. VEGETATION IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	The impacts on vegetation (individuals or communities) would not be measurable. The abundance or distribution of individuals would not be affected or would be slightly affected. The effects would be on a small scale and no species of special concern would be affected. Ecological processes and biological productivity would not be affected.
Minor	The action would not necessarily decrease or increase the project area's overall biological productivity. The alternative would affect the abundance or distribution of individuals in a localized area, but would not affect the viability of local or regional populations or communities. Mitigation to offset adverse effects, including special measures to avoid affecting species of special concern, would be required and would be effective. Mitigation may be needed to offset adverse effects, would be relatively simple to implement, and would likely be successful.
Moderate	The action would result in effects on some individual native plants and would also affect a sizeable segment of the species' population over a relatively large area. Permanent impacts would occur to native vegetation, but in a relatively small area. Some special status species would also be affected. Mitigation measures would be necessary to offset adverse effects and would likely be successful.
Major	The action would have considerable effects on native plant populations, including special status species, and would affect a relatively large area within and outside the park. Extensive mitigation measures to offset the adverse effects would be required; success of the mitigation measures would not be guaranteed.

Short-term impact—recovers in less than 1 year
Long-term impact—takes more than 1 year to recover

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts of the Alternative. There would be no project-related ground disturbance with the potential to adversely impact vegetation. Vegetation adjacent to the existing roadway would continue to be affected by erosion of fill slopes from improper drainage and sediment deposition. The No Action Alternative would not involve land-disturbing activities that would likely increase the number and distribution of exotic or noxious weeds. Vegetation effects would be local, long-term, negligible, and adverse.

Cumulative Impacts. Past actions, such as road construction and maintenance activities, have resulted in vegetation clearing and introduction of invasive exotic plants. Planned future prescribed burning on the east side of the park would result in changes in vegetation composition and density. Rehabilitation of the Kolob Terrace Road would result in temporary disturbances to vegetation and the potential for weed introduction similar to those expected for the Preferred Alternative. Past, present, and reasonably foreseeable future projects would have a local long-term minor adverse effect on vegetation resources. Those

impacts, in combination with the local long-term negligible adverse effects of the No Action Alternative, would result in a local long-term minor adverse cumulative impact.

Conclusion. The No Action Alternative would have local long-term negligible adverse effects on vegetation adjacent to the highway from erosion and drainage problems. Cumulative effects would be local, long-term, minor, and adverse. Because there would be no major adverse or unacceptable impacts to vegetation, there would be no impairment of park resources or values.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. Highway rehabilitation would occur primarily within the existing disturbed roadway bench, but incidental effects on vegetation adjacent to the road would occur from installing culverts and drainage improvements, grading at existing culverts and inlets, repairing and installing guard walls, and expanding pullouts. Construction activities would be confined to the smallest area necessary to complete the work and all areas of disturbed vegetation would be restored with native vegetation following construction. Infestation and spread of invasive exotic plants is possible. Weeds frequently invade disturbed ground where they are easily established and out-compete native species if left unchecked. Implementation of BMP weed control practices would minimize the potential for weed establishment and long-term impacts. Revegetation of disturbed areas is expected to take more than 1 year because of the low soil fertility and water holding capacity of soils. The Preferred Alternative would have local long-term minor adverse effects from disturbance of less 0.5 acre of vegetation. Rehabilitation actions that reduce erosion and promote soil stability would have long-term beneficial effects on vegetation.

Cumulative Impacts. Past actions, such as road construction and maintenance activities, have resulted in vegetation clearing and introduction of invasive exotic plants. Planned future prescribed burning on the east side of the park would result in changes in vegetation composition and density. Rehabilitation of the Kolob Terrace Road would result in temporary disturbances to vegetation and the potential for weed introduction similar to those expected for the Preferred Alternative. Past, present, and reasonably foreseeable future projects would have a local long-term minor adverse effect on vegetation resources. Those impacts, in combination with the local long-term minor adverse effects of the Preferred Alternative, would result in local long-term minor adverse cumulative impacts.

Conclusion. The Preferred Alternative would have local long-term minor adverse effects on vegetation from road rehabilitation disturbances that are estimated to affect less than 0.5 acre of vegetation. Weed establishment in areas of disturbed soil is also possible, but would be minimized with weed control practices. Improvements to drainage and reductions in erosion would have a long-term beneficial effect on vegetation. Cumulative effects would be local, long-term, minor, and adverse. Because there would be no major adverse or unacceptable impacts to vegetation, there would be no impairment of park resources or values.

WILDLIFE

Affected Environment

The diverse vegetation communities within Zion support a variety of wildlife species. Lands managed by the NPS provide havens for wildlife because they are more protected and generally less developed than privately owned lands. Zion is home to six species of amphibians, 28 species of reptiles, 79 mammal species, 289 bird species, and seven fish species. Wildlife habitat in the project area is a mixture of woodlands, mixed shrubs, and slickrock with scattered pockets of vegetation. Common wildlife species in the pinyon/juniper woodlands west of the tunnel include mule deer, ringtail, porcupine, gray fox, rock squirrel, canyon mouse, pinyon mouse, striped whipsnake, western whiptail, and tree lizard. Birds likely to occur in the pinyon/juniper woodlands include western scrub jay, pinyon jay, juniper titmouse, and black-throated gray warbler. Common wildlife species east of the tunnel include species adapted to a landscape dominated by sandstone slickrock outcrops, bare soil, and stone formations. Those species include desert bighorn sheep, ringtail, gray fox, rock squirrels, and various lizards and snakes. The project area currently experiences a high volume of traffic and human activity; therefore, most wildlife species present near the highway are likely habituated to the existing levels of human activity.

Desert bighorn sheep are an important and visible component of wildlife in Zion that were reintroduced to the park in 1977 and 1978. The population of desert bighorns has increased over the years. Habitat studies have estimated that 21 percent of the park is suitable habitat for bighorns, and that the suitable habitat in the park could potentially support up to 200 to 250 individuals (Smith and Flinders 1992; McCutchen 1994). During an aerial survey on December 5, 2008, Utah Division of Wildlife Resources (UDWR) biologists counted 75 individuals and estimated a total population of 188 individuals in the areas north, east, and south of the tunnel and on the north side of Parunuweap (UDWR 2008). Desert bighorn sheep are frequently observed from the highway, especially east of the tunnel (Crow, pers. comm. 2009).

Impact Intensity Threshold

The NPS Organic Act, which directs parks to conserve wildlife unimpaired for future generations, is interpreted to mean that native animal life should be protected and perpetuated as part of the park's natural ecosystem. Natural processes are relied on to control populations of native species to the greatest extent possible; otherwise they are protected from harvest, harassment, or harm by human activities. According to NPS *Management Policies 2006,* the restoration of native species is a high priority (sec. 4.1). Management goals for wildlife include maintaining components and processes of naturally evolving park ecosystems, including natural abundance, diversity, and the ecological integrity of plants and animals. Information on Zion wildlife was taken from park documents and records, Zion natural resource management staff, and other sources. The thresholds of change for the intensity of impacts to wildlife are defined in Table 9.

TABLE 9. WILDLIFE IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Impacts would be well within natural fluctuations.
Minor	Impacts would be detectable and would not be expected to be outside the natural range of variability of native species' populations, their habitats, or the natural processes sustaining them. Mitigation measures, if needed to offset adverse effects, would be simple and successful.
Moderate	Breeding animals of concern are present; animals are present during particularly vulnerable life stages such as migration or juvenile stages; mortality or interference with activities necessary for survival would be expected on an occasional basis, but would not be expected to threaten the continued existence of the species in the park unit. Impacts on native species, their habitats, or the natural processes sustaining them would be detectable and would be outside the natural range of variability. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.
Major	Impacts on native species, their habitats, or the natural processes sustaining them would be detectable and would be expected to be outside the natural range of variability. Key ecosystem processes might be disrupted. Loss of habitat might affect the viability of at least some native species. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

Short-term impact—recovers in less than 1 year
Long-term impact—takes more than 1 year to recover

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts of the Alternative. There would be no new impacts to wildlife or wildlife habitat from the No Action Alternative. Existing impacts from traffic and human activity in the area would continue unchanged.

Cumulative Impacts. Construction of the highway resulted in the loss and fragmentation of wildlife habitat and ongoing vehicle traffic and human activity in the project area continue to influence wildlife. Planned future prescribed burning on the east side of the park would have short-term minor adverse effects on wildlife, but generally long-term benefits for many animals. Rehabilitation of the Kolob Terrace Road would result in temporary disturbances to wildlife during construction. Past, present, and reasonably foreseeable future actions have had local long-term minor adverse impacts on wildlife. There would be no cumulative impacts.

Conclusion. The No Action Alternative would have no new impacts on wildlife and would not add to cumulative impacts.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. Construction activities would primarily be limited to existing paved and disturbed areas, so there would be negligible impacts to wildlife habitat. Human presence and construction noise would temporarily disturb and displace resident wildlife, including desert bighorn sheep. Reduction of the speed limit from 35 mph to 30 mph from the Pine Creek Bridge to County Line Curve would be a long-term benefit to wildlife by reducing the potential for vehicle/wildlife collisions. Night work would result in increased disturbance to nocturnal species from noise and lights; however, construction would not occur from 5 A.M. to 7 A.M. and from 7 P.M. to 9 P.M. to minimize impacts to crepuscular wildlife that are most active at dawn and dusk. Lights used for night construction activities would be shielded and directed downward to minimize the areas

impacted by the artificial light and to avoid light pollution. The construction contractor would be required to keep all garbage and food waste contained and removed daily from the work site to avoid attracting wildlife into the construction zone. Construction workers would be instructed to remove food scraps and not feed or approach wildlife. Overall, the Preferred Alternative would result in local short-term minor adverse effects on wildlife. Construction-related disturbance would be limited to one season; therefore, there would be no long-term adverse impacts to wildlife, but there would be long-term benefits from reducing the speed limit.

As described in the Hydrology and Water Quality section, potential effects to Clear Creek and Pine Creek near the highway, as well downstream in the Virgin River are expected to be short-term and minor from possible sediment introduction during construction. BMPs would be implemented to control erosion and prevent stream sedimentation. As a result, potential effects to fish habitat and spawning would be local, short-term, negligible, and adverse. Over the long term, implementation of the Preferred Alternative would result in a beneficial effect on fish and other aquatic species by correcting drainage deficiencies and deteriorating road conditions that impact water quality.

Cumulative Impacts. Construction of the highway resulted in the loss and fragmentation of wildlife habitat, and ongoing vehicle traffic and human activity in the project area continues to influence wildlife. Planned future prescribed burning on the east side of the park would have short-term adverse effects on wildlife, but generally long-term benefits for many animals. Rehabilitation of the Kolob Terrace Road would result in temporary disturbances to wildlife during construction. Past, present, and reasonably foreseeable future actions have had local long-term minor adverse impacts on wildlife. Those impacts, in combination with the local short-term minor adverse impacts of the Preferred Alternative, would result in local long-term minor adverse cumulative impacts.

Conclusion. The additional noise and disturbance during construction would result in local short-term minor adverse effects on wildlife, with long-term benefits associated with a reduction in the speed limit. Because activities would occur primarily within the footprint of existing facilities, there would be a negligible effect to wildlife habitat. Potential effects to fish from possible impacts to stream water quality during construction would be short-term, negligible, and adverse, with long-term benefits from water quality improvements. Cumulative effects would be local, long-term, minor, and adverse. Because there would be no major adverse or unacceptable impacts to wildlife, there would be no impairment of park resources or values.

SPECIAL STATUS SPECIES

Affected Environment

Special status species include species listed as threatened, endangered, or candidate under the Endangered Species Act (ESA); species considered sensitive by the park; species on the Utah sensitive species list (Utah DNR 2007); and species for which a conservation agreement is in place. Federally listed and candidate species that are present in Zion, based on surveys, staff knowledge, USFWS data, available habitat, and known range are listed in (Table 10).

TABLE 10. FEDERALLY LISTED AND CANDIDATE SPECIES, ZION NATIONAL PARK

Common Name	Scientific Name	Federal Status	Found in Project Area?*
Mexican spotted owl	*Strix occidentalis lucida*	Threatened	Yes
California condor	*Gymnogyps californianus*	Endangered	Yes
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	Candidate	No
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered	No
Desert tortoise	*Gopherus agassizii*	Threatened	No
Shivwits milkvetch	*Astragalus ampullarioides*	Endangered	No

*Crow, pers. comm. (2009).

Zion is within the Colorado Plateau Recovery Unit (CP-11) for the Mexican spotted owl, which is listed as a threatened species. The Mexican spotted owl reaches the northwestern limits of its range in the CP-11 (USFWS 1995), and all of the park and project area is designated as critical habitat for this species (USFWS 2004, CFR Vol. 69, No. 168, 2004). The identification of critical habitat is based on data available at the time of designation. The focus for critical habitat is on the physical and biological features essential to the conservation of the species, referred to as the primary constituent elements, that are within areas occupied by the species at the time of listing, and that may require special management considerations and protection. The primary constituent elements necessary to ensure the conservation of Mexican spotted owl include: the presence of water; abundance of canyon walls with crevices, caves, and ledges; clumps or stringers of mixed conifer, pine-oak, pinyon-juniper, or riparian vegetation; and a high percentage of ground litter and woody debris.

A Mexican spotted owl monitoring program, initiated by the park in 1995, has confirmed that Mexican spotted owls primarily use steep-walled rocky canyons, and that core owl nesting and roosting areas occur below canyon rims in areas with narrow canyon floors and high vertical walls that contain protected ledges, fractures, or caves. These "slot canyons" provide cooler microclimates that may be favored by owls (Rinkevich 1991). Monitoring in Zion has identified 20 Protected Activity Centers (PACs), consisting of 34 cores. PACs of at least 600 acres were created following USFWS direction (USFWS 1995). Cores are defined as areas in which Mexican spotted owls spend 90 percent of daylight hours roosting during the nesting season (March 1 to August 31). Portions of the highway traverse two PACs on the east side of the tunnel, including the core area of one PAC.

A nonessential, experimental population (Section 10(j) of the ESA) of the federally endangered California condor was reintroduced into northern Arizona in 1996 (USFWS 1996). The condor must be treated as a listed threatened species under the 10(j) designation in the park. Since the summer of 2004, groups of California condors have used an area north of the park on Kolob Terrace. More than 85 percent of the Arizona-Utah flock were in that area in the summer of 2008 (Arizona Game and Fish Department 2008), many of which flew through the main canyon of the park on the way back to Arizona in the fall. The condors generally leave the park by January, and return in February or March and they seem to be leaving later and returning sooner each year (Day 2008). Condors have been observed in the main canyon since the summer of 2006. In July 2008, park visitors reported condors on the railing at Canyon Overlook, next to the east entrance of the tunnel. The condors appear to be expanding their range farther north from the northern Arizona reintroduction site. They do not breed in the park, but it is anticipated that they may establish nest sites in the future.

Zion also provides habitat for other sensitive wildlife species as designated under conservation agreements or listing as a Utah sensitive species (Table 11). Seven of these species potentially occur in the project area.

TABLE 11. SENSITIVE WILDLIFE SPECIES, ZION NATIONAL PARK

Common Name	Scientific Name	Sensitivity Status	Found in Project Area?*
Bluehead sucker	*Catostomus discobolus*	CA	No
Bonneville cutthroat trout	*Oncorhynchus clarkii utah*	CA	No
Colorado cutthroat trout	*Oncorhynchus clarkii pleuriticus*	CA	No
Desert sucker	*Catostomus clarkii*	SOC	No
Flannelmouth sucker	*Catostomus latipinnis*	CA	No
Virgin River spinedace	*Lepidomeda mollispinis mollispinis*	CA	No
Arizona toad	*Bufo microscaphus*	SOC	Yes
Common chuckwalla	*Sauromalus ater*	SOC	Yes
Gila monster	*Heloderma suspectum*	SOC	No
Western banded gecko	*Coleonyx variegatus*	SOC	Yes
Zebra-tailed lizard	*Callisaurus draconoides*	SOC	No
American white pelican	*Pelecanus erythrorhynchos*	SOC	No
Bald eagle	*Haliaeetus leucocephalus*	RD	No
Black swift	*Cypseloides niger*	SOC	No
Burrowing owl	*Athene cunicularia*	SOC	No
Ferruginous hawk	*Buteo regalis*	SOC	No
Lewis' woodpecker	*Melanerpes lewis*	SOC	No
Long-billed curlew	*Numenius americanus*	SOC	No
Northern goshawk	*Accipiter gentilis*	CA	No
Peregrine falcon	*Falco peregrinus anatum*	P	Yes
Short-eared owl	*Asio flammeus*	SOC	No
Allen's big-eared bat	*Idionycteris phyllotis*	SOC	No
Big free-tailed bat	*Nyctinomops macrotis*	SOC	No
Fringed myotis	*Myotis thysanodes*	SOC	Yes
Kit fox	*Vulpes macrotis*	SOC	No
Mountain lion	*Puma concolor*	P	Yes
Spotted bat	*Euderma maculatum*	SOC	No
Townsend's big-eared bat	*Corynorhinus townsendii*	SOC	Yes
Western red bat	*Lasiurus blossevillii*	SOC	No

CA = Conservation agreement, SOC = State species of concern, RD = recently delisted from federally threatened, P = monitored by the park.
*Based on potential to occur in rocky or pinyon/juniper woodland habitat and based on park staff knowledge of the area (Crow, pers. comm. 2009).

The Arizona toad potentially occurs in pinyon/juniper woodland habitat west of the tunnel, as well as in riparian areas downstream from the project area. The common chuckwalla and western banded gecko potentially occur in rocky areas east of the tunnel.

The peregrine falcon was removed from the federal list of endangered and threatened species in 1999, but is still monitored by the Park. Zion is known to have 19 historic falcon territories. A peregrine falcon nesting territory occurs near the west entrance to the tunnel. Peregrine falcons begin nest site selection in early March at Zion, and have generally completed the nesting season by the middle of July (Hetzler, pers. comm. 2007, 2008). The park monitors a subset of peregrine territories each year, including all of the territories near established climbing routes. Climbing areas with known historic nest sites are closed to visitor use at the beginning of each nesting season. If a nest site is used in a particular year, the area remains closed to visitor use until the young falcons have fledged. Once nest site

selection is completed, climbing areas where nest sites are not used are reopened to visitor use.

Fringed myotis and Townsend's big-eared bat forage in semi-desert shrublands, pinyon/juniper woodlands, and open montane forests; and roost in caves, mines, and buildings (Harvey et al. 1999). The pinyon/juniper woodlands near the project area may provide foraging habitat for these species. Mountain lions are known to occur in the park, and are likely to inhabit the pinyon/juniper woodlands and rocky terrain near the project area.

The flannelmouth sucker and Virgin River spinedace do not occur in the project area, but occur in waters downstream from the action area. Both fish have similar ranges in the park and are found in the North Fork and East Fork of the Virgin River and several short tributaries within Zion and Parunuweap Canyons. The fish are found downstream of the park in North Creek and LaVerkin Creek.

Zion also hosts 22 plant species considered "sensitive" by the park and the state of Utah because of their limited distribution (endemism) or because they are disjunct from more abundant population centers. Table 12 lists Zion sensitive plants according to habitat. Charleston's violet and Zion penstemon grow in more than one habitat type (NPS 2004). Nine sensitive plant species potentially occur in the project area. No federally listed plant species occur in the project area.

TABLE 12. SENSITIVE PLANT SPECIES BY HABITAT TYPE IN ZION

Habitat	Common Name	Scientific Name	Potentially Found in Project Area?
Ponderosa pine forest understory or pinyon pine understory	Clark's lomatium	*Lomatium graveolens var. clarkii*	No
	Zion penstemon	*Penstemon humilus var. obtusifolia*	Yes
	Higgin's penstemon	*Penstemon leonardii var. higginsii*	No
	Charleston's violet	*Viola charlestonensis*	No
	Bog violet	*Viola clauseniana*	No
Dry meadows	Religious daisy	*Erigeron religiosus*	Yes
Exposed limestone	Panguitch buckwheat	*Eriogonum panguinense*	No
	Charleston's violet	*Viola charlestonensis*	No
Chinle and Moenkopi Formations (barren badlands)	Springdale buckwheat	*Eriogonum corymbosum var. matthewsiae*	No
	Chia	*Salvia columbariae var. argentea*	No
Sandstone soils and crevices	Zion draba	*Draba asperella*	Yes
	Canaan daisy	*Erigeron canaani*	Yes
	James' buckwheat	*Eriogonum jamesii*	Yes
	Zion buckwheat	*Eriogonum racemosum var. zionis*	Yes
	Jones' goldenaster	*Heterotheca jonesii*	Yes
	Zion penstemon	*Penstemon humilus var. obtusifolia*	Yes
	Utah spikemoss	*Selaginella utahensis*	Yes
	Ruth's sphaeromeria	*Sphaeromeria ruthiae*	Yes
Hanging garden or wetland	Foster's columbine	*Aquilegia formosa var. fosteri*	No
	Black spleenwort	*Asplenium adiantum-nigrum*	No
	Hays' sedge	*Carex haysii*	No
	Zion daisy	*Erigeron sionis*	No
	Cliff jamesia	*Jamesia americana*	No
	Charleston's violet	*Viola charlestonensis*	No

Source: Nielsen, pers. comm. (2009).

Most of the species potentially occurring in the action area are specialized to sandstone soils and crevices (Zion draba, Canann daisy, James' buckwheat, Zion buckwheat, Jones' goldenaster, Zion penstemon, Utah spikemoss, and Ruth's sphaeromeria); or dry meadows (religious daisy).

Impact Intensity Threshold

Section 7 of the ESA mandates all federal agencies to determine how to use their existing authorities to further the purposes of the ESA to aid in recovering listed species, and to address existing and potential conservation issues. Section 7(a)(2) states that each federal agency shall, in consultation with the Secretary of the Interior, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. NPS *Management Policies 2006* state that potential effects of agency actions would also be considered for state or locally listed species (i.e., special status species). The thresholds of change for the intensity of impacts to special status species are defined in Table 13.

TABLE 13. SPECIAL STATUS SPECIES IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	The action would result in a change to a population or individuals of a species, but the change would not be of measurable or perceptible consequence and would be well within natural variability. In the case of federally listed species, this impact intensity equates to a USFWS determination of "may affect, not likely to adversely affect."
Minor	The action would result in a change to a population or individuals of a species. The change would be measurable, but small and localized, and not outside the range of natural variability. Mitigation measures, if needed, would be simple and successful. In the case of federally listed species, this impact intensity equates to a USFWS determination of "may affect, not likely to adversely affect."
Moderate	Impacts on special status species, their habitats, or the natural processes sustaining them would be detectable and occur over a large area. Breeding animals of concern are present, animals are present during particularly vulnerable life stages; mortality or interference with activities necessary for survival would be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the park unit or conservation zone. Mitigation measures would be extensive and likely successful. In the case of federally listed species, this impact intensity equates to a USFWS determination of "may affect, likely to adversely affect."
Major	The action would result in noticeable effects to the viability of the population or individuals of a species. Impacts on special status species or the natural processes sustaining them would be detectable, both inside and outside of the park. Loss of habitat might affect the viability of at least some special status species. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed. In the case of federally listed species, the impact intensity equates to a USFWS determination of "may affect, likely to jeopardize the continued existence of a species."

Short-term impact—recovers in less than 1 year
Long-term impact—takes more than 1 year to recover

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts of the Alternative. There would be no new impacts to special status species or critical habitat from the No Action Alternative. Existing impacts from traffic and human activity in the area would continue unchanged.

Cumulative Impacts. Construction of the highway and ongoing vehicle traffic and human activity in the project area have impacted special status species and habitat. Planned

future prescribed burning on the east side of the park would have short-term adverse effects on special status species, but generally long-term benefits associated with habitat maintenance. Rehabilitation of the Kolob Terrace Road could temporarily affect sensitive wildlife species during construction, but no effects to Mexican spotted owl or California condor are anticipated. No impact to sensitive plant species are expected at Kolob Terrace. Past, present, and reasonably foreseeable future actions would have a local long-term minor adverse impact on special status species. The continued impact from traffic and human activity would not contribute additional cumulative impacts to special status species.

Conclusion. The No Action Alternative would have no new impacts on special status species and no cumulative effects. Because there would be no major adverse or unacceptable impacts to special status species, there would be no impairment of park resources or values.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. The Preferred Alternative would introduce noise and human disturbance during construction that would affect several special status species. Although there would be no impact to special status species habitat, temporary disturbance to several species is possible. Species-specific impacts related to the Preferred Alternative are described below.

Highway rehabilitation under the Preferred Alternative would overlap nearby roosting and nesting habitat for one Mexican spotted owl PAC. A portion of the highway overlaps the outer perimeter of a second PAC. No adverse effect on Mexican spotted owls in the second PAC would occur from the Preferred Alternative because of the distance of nesting and roosting habitat from the highway. The remainder of the discussion of impacts and mitigation focuses on the PAC with roosting and nesting habitat near the highway. To protect the owls, the location of the PAC is not disclosed in this EA.

Currently, noise and human activity near the PAC occurs as a result of frequent automobile, bus, and motorcycle traffic, and visitor use of trails and pullouts. In addition, large trucks, snowplows, and other equipment periodically operate nearby to perform routine maintenance. The Preferred Alternative includes work that is similar to routine maintenance such as repairing guard walls, repairing culverts, and grading ditches and pullouts. The Preferred Alternative also includes construction activities that generate considerably more noise disturbance than regular maintenance activities. For example, pulverizing existing pavement prior to grading and overlay of new pavement would generate noise levels above current conditions. The primary constituent elements necessary to ensure the conservation of Mexican spotted owl include: the presence of water; abundance of canyon walls with crevices, caves, and ledges; clumps or stringers of mixed conifer, pine-oak, pinyon-juniper, or riparian vegetation; and a high percentage of ground litter and woody debris. There are no proposed actions that would alter any of the primary constituent elements and therefore implementation of the Preferred Alternative is not anticipated to diminish the contribution of the constituent elements of critical habitat for the recovery of Mexican spotted owl. The Preferred Alternative would not result in reduction or adverse modification for Mexican spotted owl critical habitat.

To avoid and minimize the potential impact to Mexican spotted owls from roadwork within the PAC, the following mitigation measures would be used:

1. No night work or construction activity between 7 P.M. and 7 A.M. would be allowed within the PAC during the breeding season (March 1 to August 31 or until the owls have fledged as described below).
2. Construction activities with noise levels similar to ongoing maintenance and traffic would be allowed in the PAC between 7 A.M. and 7 P.M. because the owls are likely acclimated to this background level of ambient noise and activity. This would include construction activities such as repair and installation of guard walls and culvert work.
3. Other more intensive construction activities, such as pavement pulverizing, grading, and pavement overlay would be restricted within the PAC within the March 1 to August 31 breeding season. However, park biologists would monitor the nesting progress of the owls, and if monitoring indicates that the young owls have fledged prior to August 31, more intensive construction activities would be allowed at that time.
4. No blasting would be allowed within the PAC during the breeding season.
5. No fueling of vehicles would be allowed within the PAC.

With implementation of the proposed mitigation measures, the Preferred Alternative would have local short-term minor impacts to the Mexican spotted owl due to construction noise and activity. Thus, the Preferred Alternative may affect, but is not likely to adversely affect the Mexican spotted owl.

California condors are summer visitors to the park and do not currently use the park as a breeding area. Although condors are infrequent visitors to the project area, they have been observed at the Canyon Overlook Trail, next to the east entrance of the tunnel. Because they occasionally occur near the project area, condors would potentially be disturbed by increased noise and human activity during construction. Mitigation measures implemented for Mexican spotted owl also would reduce potential impacts to condors. Impacts to condors would be local, short-term, and negligible because there is no breeding habitat near the project area, their presence is rare, and they could easily avoid construction activity. Thus, condors may be affected by the Preferred Alternative, but are unlikely to be adversely affected.

Flannelmouth sucker and Virgin River spinedace do not occur in the project area, but would potentially be affected by the Preferred Alternative if sediment from project activities were to reach Pine Creek and be transported downstream. Arizona toad also is found in riparian habitat near streams. Erosion control BMPs for drainage and sediment would be implemented to prevent or reduce nonpoint source pollution and minimize soil loss and sedimentation in drainage areas. A SWPPP would be developed and approved by the park prior to commencing any near-water activities. Potential effects on flannelmouth sucker, Virgin River spinedace, and Arizona toad would be local, short-term, negligible, and adverse. Over the long term, implementation of the Preferred Alternative would result in a beneficial effect on these fish and other aquatic species by correcting drainage deficiencies and deteriorating road conditions.

Common chuckwalla and western banded gecko occur in the rocky habitat near the project area and would be displaced temporarily by construction noise and human activity. Impacts would be local, short-term, negligible, and adverse.

A peregrine falcon nesting territory occurs on the steep rock face by the west entrance to the tunnel. Nesting peregrines are likely to be acclimated to the existing levels of noise from traffic along the highway; however, they could be affected by increased noise and human disturbance during construction, especially along the section of road immediately west of the tunnel. The park monitors this nesting area annually to determine closures of climbing routes in the area. Typically by the end of April to early May, park biologists would have determined if nesting is occurring in the area. To mitigate for potential impacts to peregrine falcon nesting, the loudest construction activities (milling and pulverizing) would be prohibited within the upper two sections of road from the Nevada Switchback to the west tunnel portal from March 1 to May 15 until peregrine nesting is confirmed. If the nesting area is determined active, milling, pulverizing, and pavement overlay in this section of the highway would not occur until park biologists confirm that the young peregrines have fledged. This typically occurs by the end of July. Other construction activities similar in noise to existing traffic and maintenance work could occur at any time. If the peregrines are not present in the nesting area near the highway or if the loudest construction activities, such as milling and pulverizing, begin before March 1, then there would be no construction restrictions. With implementation of these mitigation measures and because peregrine falcons nesting are acclimated to noise and activity in this area, impacts to peregrine falcons would be local, short-term, minor, and adverse.

Fringed myotis and Townsend's big-eared bat would potentially be affected by noise and human disturbance during construction. Foraging behavior would be affected by increased noise or use of artificial lights during night construction when bats are active. Mitigation measures, such as prohibiting construction from 5 A.M. to 7 A.M. and 7 P.M. to 9 P.M., would reduce potential for disturbance to these species. Impacts would be local, short-term, minor, and adverse.

Mountain lions are likely to occur in the project area and would potentially be affected by increased noise and human activity during construction. Mitigation measures, such as prohibiting construction from 5 A.M. to 7 A.M. and 7 P.M. to 9 P.M., would reduce potential for disturbance to mountain lions. Because mountain lions have wide ranges and are very mobile, they are likely to avoid the area during construction, resulting in local short-term negligible adverse impacts due to changes in behavior of individual lions.

Potential effects on sensitive plant species is unlikely because of the limited suitable habitat in the construction area and because less than 0.5 acre of vegetation would be disturbed. Sensitive plant surveys would be conducted prior to disturbance of any suitable habitat to avoid impacts. Thus, no adverse impact to sensitive plant species is anticipated.

Cumulative Impacts. Construction of the highway resulted in the loss and fragmentation of habitat for special status species, and ongoing vehicle traffic and human activity in the project area continues to have adverse effects. Planned future prescribed burning on the east side of the park would have short-term adverse effects on special status species, but generally long-term benefits for many plants and animals are anticipated. Rehabilitation of the Kolob Terrace Road could temporarily affect sensitive wildlife species during construction, but no effects to Mexican spotted owl or California condor are anticipated. No impact to sensitive plant species are expected at Kolob Terrace. Past, present, and reasonably foreseeable future actions would have a local long-term minor adverse impact on special status species. Those

impacts, in combination with the local short-term minor impacts of the Preferred Alternative, would result in local long-term minor adverse cumulative impacts.

Conclusion. The additional noise and disturbance during construction would result in impacts on several special status animal species. The Preferred Alternative may affect, but is unlikely to adversely affect, Mexican spotted owl and California condor. Mitigation measures would be implemented to restrict the timing of the loudest construction activities near Mexican spotted owl habitat until after young owls have fledged. These measures would also reduce potential impacts to California condors, which are only occasional visitors to the area. Impacts to flannelmouth sucker, Virgin River spinedace, Arizona toad, common chuckwalla, western banded gecko, fringed myotis, Townsend's big-eared bat, and mountain lion would be local, short-term, negligible to minor, and adverse from the temporary disturbances and activities during construction. Long-term beneficial effect on fish and aquatic species would occur from correcting drainage deficiencies and deteriorating road conditions that generate erosion. No adverse impacts on sensitive plant species is anticipated because of the limited area of disturbance and lack of suitable habitat, and there are no threatened or endangered plant species in the project area. Cumulative effects would be local, long-term, minor, and adverse, with a local short-term minor contribution from the Preferred Action. Because there would be no major adverse or unacceptable impacts to special status species, there would be no impairment of park resources or values.

HYDROLOGY AND WATER QUALITY

Affected Environment

Zion is located entirely within the Virgin River basin. Clear Creek, from the eastern park boundary to its confluence with Pine Creek, parallels much of the highway. Pine Creek is a tributary to the North Fork of the Virgin River. The Clear Creek/Pine Creek watershed drains about 34 square miles with about half of the headwaters of the watershed located outside of the park. Clear Creek and Pine Creek are intermittent streams for most of their 12-mile length, with flows occurring primarily during spring runoff and the winter months. Streamflow in the summer is infrequent and typically occurs following thunderstorms. Pine Creek flows are perennial in the lower 1.5 miles upstream of the confluence with the North Fork of the Virgin River west of the tunnel. Summer base flow in lower Pine Creek is about 10 gallons per minute (O'Dell et. al 2004); however, during severe thunderstorms, because of the large area of slickrock in the watershed, flows can rapidly increase to hundreds of cubic feet per second for brief periods.

Limited data indicates Pine Creek water quality is generally good, with few potential sources of contaminants within the park other than natural erosion and road runoff. Upstream land uses outside of the park, such as livestock grazing and roads, also can affect water quality. Sediment concentrations and turbidity are the most distinguishing and variable water quality characteristics for Pine Creek. The amount of sediment and clarity of the water is directly related to the volume of runoff. At base flows turbidity levels of less than 1 NTU (a measure of water clarity) have been recorded, although during storm events turbidity values of several thousand NTUs are likely. Total dissolved solids (196 mg/l) and fecal coliform concentrations (2.1 col/100 ml) are typically low in Pine Creek relative to the water quality for other regional streams (O'Dell et. al 2004).

Impact Intensity Threshold

Available information on hydrology and water quality in the project area was compiled. Potential impacts from the alternatives are based on professional judgment, experience with similar actions, and project disturbance. The thresholds of change for the intensity of an impact on hydrology and water quality are defined in Table 14.

TABLE 14. HYDROLOGY AND WATER QUALITY IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	An action that would result in a change to a hydrologic resource, but the change would be so small that it would not be of measurable or perceptible consequence.
Minor	An action that would result in a change to a hydrologic resource, but the change would be small, localized, and of little consequence.
Moderate	An action that would result in a change to a hydrologic resource; the change would be measurable and of consequence.
Major	An action that would result in a noticeable change to a hydrologic resource; the change would be measurable and result in a severely adverse or major beneficial impact with regional consequences.

Short-term impact—following project completion, recovers in less than 1 year
Long-term impact—following project completion, takes more than 1 year to recover

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts of the Alternative. The No Action Alternative would not result in any new disturbances that would impact water resources. Roadway drainage problems would persist, which would lead to erosion and transport of soil into Clear Creek and Pine Creek. Hydrologic and water quality effects of the No Action Alternative would be local, long-term, negligible, and adverse.

Cumulative Impacts. Original construction of the highway has modified the natural drainage patterns of ephemeral washes and seeps. Roadway drainage structures currently route runoff, snowmelt, and seep discharges to natural drainages via ditches, inlets, and culverts. While much of the project area consists of impervious slickrock, the asphalt highway further adds impervious surface, which increases runoff during precipitation events. Planned future prescribed burning on the east side of the park may also effect hydrologic and water quality processes by temporarily removing surface cover and increasing runoff and the concentration of nutrients in runoff. Drainage work on the Kolob Terrace Road may result in temporary minor increases in erosion and sediment contribution to streams tributary to the Virgin River downstream of the park. Past, present, and reasonably foreseeable future actions would have a local long-term minor adverse impact on water resources. Those impacts, in combination with the local long-term negligible adverse impacts of the No Action Alternative, would result in local long-term minor adverse effects.

Conclusion. The No Action Alternative would result in local long-term negligible adverse effects on water resources from ongoing drainage and erosion problems associated with the deteriorating condition of the highway. Cumulative effects would be local, long-term, minor, and adverse, with a negligible adverse contribution from the No Action Alternative. Because there would be no major adverse or unacceptable impacts to hydrology and water quality, there would be no impairment of park resources or values.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. Proposed highway rehabilitation involving excavation, grading, and exposure of soil material would increase the potential for erosion until vegetation is established, paving is completed, drainage work is installed, and other stabilization work is finished. The transport of sediment to Clear Creek, Pine Creek, or other ephemeral drainages is possible during construction, although BMP soil- and erosion control measures would be used to contain and control erosion. No measurable effects on Clear Creek or Pine Creek water quality would occur because of the use of BMPs and because any sediment contributions to these mostly intermittent streams would be very minor in relation to the supply of sediment and erosion naturally occurring in this watershed. Construction activities would primarily occur during the time of the year when there are no flows in Clear Creek or Pine Creek on the east side of the tunnel. Pine Creek flows are perennial on the west side of the tunnel, but the road is generally more distant from the stream, so that minor amounts of soil movement are unlikely to reach the stream. There would be a negligible increase in impervious area from paving several unpaved pullouts or minor expansion of existing pullouts. Proposed drainage improvements would better collect and dissipate runoff and reduce the potential for erosion and stream sedimentation. Local short-term minor adverse effects on hydrology and water quality are possible during construction, but long-term effects would be beneficial as a result of improvements in drainage and the condition of the roadway surface.

Cumulative Impacts. Original construction of the highway has modified the natural drainage patterns of ephemeral washes and seeps. Roadway drainage structures currently route runoff, snowmelt, and seep discharges to natural drainages. Because much of the project area consists of impervious slickrock, the additional area of asphalt highway and impervious surface causes a very minor increase in runoff during precipitation events. Planned future prescribed burning on the east side of the park may also effect hydrologic and water quality processes by temporarily removing surface cover and increasing runoff and the concentration of nutrients in runoff. Drainage work on the Kolob Terrace Road may result in temporary minor increases in erosion and sediment contribution to streams tributary to the Virgin River downstream of the park. Past, present, and reasonably foreseeable future actions would have a local long-term minor adverse impact on water resources. Those impacts, in combination with the local short-term minor adverse impacts and long-term beneficial effects of the Preferred Alternative, would result in local long-term minor adverse cumulative impacts.

Conclusion. The Preferred Alternative would have local short-term minor adverse effects on hydrology and water quality during construction from surface disturbances that may generate erosion and increased sediment runoff, but long-term effects would be beneficial as a result of improvements in drainage and the condition of the road surface. There would be a negligible increase in impervious area from paving several unpaved pullouts or minor expansion of existing pullouts. Cumulative effects would be local, long-term, minor, and adverse, with a short-term minor adverse contribution from the Preferred Alternative and a long-term beneficial effect. Because there would be no major adverse or unacceptable impacts to hydrology and water quality, there would be no impairment of park resources or values.

HISTORIC STRUCTURES

Affected Environment

Historic structures include elements of the built environment associated with the construction of the Zion-Mt. Carmel Highway and could include other nonrelated NPS properties such as access roads and mining operations related to the original construction of the highway.

The highway was one of the most expensive stretches of road to construct at the time of completion in 1930, incorporating easy grades, scenic vistas, minimal landscaping, and rustic style aesthetics. The highway, listed on the NRHP in 1987, includes numerous associated features including bridges, tunnels, masonry retaining walls, masonry culvert headwalls, masonry curbs, guard walls, drop inlets, culverts, and other small road-related features. All of these features were built from 1927 to 1930 by the Nevada Construction Company. The highway was originally intended as part of a tour loop envisioned by the Utah Parks Company in the early 1920s to link other national park units such as Bryce, Cedar Breaks, and the North Rim of the Grand Canyon to Zion.

The highway includes 164 documented features and subfeatures, of which 150 are considered contributing elements to the overall NRHP significance of the highway. The 14 noncontributing elements are primarily unimproved culverts and drop inlets. All of the contributing features are constructed from cut and shaped native sandstone including entrance signage, culvert headwalls, retaining walls, low curbs, and stone-lined drainage ditches. Feature significance rests primarily on the fact that they are original construction elements associated with the highway, are emblematic of period National Park design, and have high aesthetic value. In some locations, culverts and drop inlets have been added since the original construction. Features such as retaining walls, curbs, culverts, and other small road features were documented as part of an amendment in preparation to the 1987 NRHP nomination of the Zion-Mt. Carmel Highway (NPS n.d.).

Major contributing components of the highway include the tunnel (excluded from analysis), the switchback section leading to the Virgin River from the tunnel's west portal, and the Pine Creek Bridge. The Pine Creek Bridge (ZHR 102) is a contributing feature identified as part of the 1987 Zion-Mt. Carmel Highway NRHP nomination and is considered significant for its association with tourism and engineering context, including its arched design intended to mimic Zion's Great Arch (NPS 2006, n.d.). Three other bridges located east of the tunnel have been included under the amended multiple resources NRHP nomination, including Co-Op Creek (ZHR 4E), Clear Creek (ZHR 6), and Upper Pine Creek bridges (ZHR 51c).

Impact Intensity Threshold

Section 106 of the NHPA of 1966, as amended (16 U.S.C. 470, et seq.) and its implementing regulations under 36 CFR 800 require all federal agencies to consider effects of federal actions on cultural properties eligible for or listed in the NRHP. In order for a structure or building to be listed in the NRHP, it must be associated with an important historic event, person(s), or that embodies distinctive characteristics or qualities of workmanship. The thresholds of change for the intensity of an impact on historic structures are defined in Table 15.

Consultation has taken place with the SHPO and 11 interested Native American Tribes to identify issues or properties of concern within the area of potential effect (APE). The APE is defined as the road prism and 10 meters to either side of the highway, and primarily includes the highway and associated structures. Prior cultural resource inventory (Betenson 1998) has identified all potential historic properties within the APE. Each identified cultural resource is assessed for significance by applying criteria outlined under 36 CFR 60.4. Potential historic properties (those determined eligible for listing on the NRHP are then assessed for effects by applying criteria outlined under 36 CFR Part 800.5.

TABLE 15. HISTORIC STRUCTURES IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	Impacts would be at the lowest level of detection with neither adverse nor beneficial consequences. The determination of effect for Section 106 would be no adverse effect.
Minor	Alteration of a historic structure would not diminish the overall integrity of the resource. The determination of effect for Section 106 would be no adverse effect.
Moderate	Alteration of a historic structure would diminish the overall integrity of the resource. The determination of effect for Section 106 would be adverse effect. A PA is executed among the NPS and applicable state or tribal historic preservation officer and, if necessary, the Advisory Council on Historic Preservation, in accordance with 36 CFR 800.6(b). Measures identified in the PA to minimize or mitigate adverse impacts reduce the intensity of the impact under NEPA from moderate to minor.
Major	Alteration of a historic structure would diminish the overall integrity of the resource. The determination of effect for Section 106 would be adverse effect. Measures to minimize or mitigate adverse impacts cannot be agreed on and the NPS and applicable state or tribal historic preservation officer and/or Advisory Council on Historic Preservation are unable to negotiate and execute a memorandum of agreement in accordance with 36 CFR 800.6(b).

Short-term impact—following project completion, effects would remain less than 1 year
Long-term impact—following project completion, effects would remain more than 1 year

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts of the Alternative. Certain architectural elements associated with the highway would continue to deteriorate under the No Action Alternative. Structural and drainage deficiencies of the highway have the potential to impact NRHP contributing elements such as guard walls, retaining walls, and culvert headwalls. If left untreated, these features would continue to degrade. Impacts to these historic features would be local, long-term, minor to moderate, and adverse.

Cumulative Impacts. Past, present, and reasonably foreseeable use of the highway and maintenance activities would have local long-term minor adverse impacts on highway historic structures. The numerous historic structures associated with original construction of the highway have been affected by traffic, visitor use, and maintenance of the roadway. In addition, previous actions that have added new structural features and changes to the landscapes such as guard walls, stone curbing, parking, and pullouts have contributed to the current condition of the landscape. Rehabilitation of the Kolob Terrace Road is expected to have negligible to minor effects to the limited historic features present near the road. Past, present, and reasonably foreseeable actions, in combination with the local long-term, minor to moderate, adverse impacts of the No Action Alternative, would result in local long-term, minor to moderate, adverse cumulative impacts.

Conclusion. Structural and drainage deficiencies that undercut or weaken guard walls, retaining walls, culvert headwalls, and other historical features, if left untreated, would result in local long-term minor adverse impacts to historic structures. Cumulative effects would be local, long-term, minor to moderate, and adverse. Because there would be no major adverse or unacceptable impacts to historic structures, there would be no impairment of park resources or values.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. Impacts to historic structures under the Preferred Alternative include constructing two new guard walls, repairing at least three existing guard walls, installing new culvert headwalls and endwalls or refurbishing original walls, and installing new stone curbing and refurbishing existing curbing. The installation of new elements or the refurbishment of existing elements would follow detailed specifications that would maintain the historic integrity of the design characteristics and craftsmanship and would be compatible with the original method of construction. The effects on existing historic highway structures would be local, long-term, minor, and adverse with long-term benefits from measures to correct roadway structural and drainage deficiencies that affect existing guard walls, retaining walls, and other historic features. An overview of the anticipated measures to maintain the historic integrity and character of the highway are described below. In compliance with Section 106 of the NHPA, the NPS and SHPO will coordinate on mitigation measures the NPS would take with implementation of the Preferred Alternative to protect and preserve historic features.

The repair or rebuilding of existing guard walls is intended to stabilize their condition. Any repair of existing guard walls would maintain at least the current reveal of exposed wall. Where guard wall removal and rebuilding is needed, dismantling would entail labeling each sandstone block and, if needed, retrofitting new blocks and mortar consistent with historic design, materials, and pattern. Damaged stone would be replaced with new stone of a similar color, size, and edge treatment.

New culvert installation would maintain historic design and materials, including similar sandstone blocks for headwalls and endwalls. The repair of existing culvert headwalls and endwalls would retain the original materials whenever possible and replacement blocks would be of the same or similar material. Headwalls and endwalls would be raised to roadway grade by adding masonry, and inlets would be raised to ditch grade by adding masonry as well. New stone would match the type and color used in existing stone structures; exposed surfaces would be clipped and feathered and the edges rounded to match the historic finish.

Stone curbing design elements and materials would be retained during refurbishment or replacement. New stone curbing would be visually compatible (e.g., similar in scale, massing and materials, texture, and orientation) as existing stone curbing.

A proposed new comfort station near the East Entrance to the park would be designed to be compatible with the nature and character of the highway. Existing pullouts would be surfaced similar to the roadway and would incorporate minimal striping. Repaving the roadway would have no effect on historic features because work would be confined to the existing disturbed footprint.

Cumulative Impacts. Past, present, and reasonably foreseeable use of the highway and maintenance activities would have local long-term minor adverse impacts on highway historic structures. The numerous historic structures associated with original construction of the highway have been affected by past and present traffic, visitor use, and maintenance of the roadway. In addition, previous actions that have added new structural features and changes to the landscapes such as guard walls, stone curbing, parking, and pullouts have contributed to the current condition of historic structures. Rehabilitation of the Kolob Terrace Road is expected to have negligible to minor effects to the limited historic features present near the road. Past, present, and reasonably foreseeable actions, in combination with the local long-term minor adverse impacts of the Preferred Alternative, would result in local long-term minor adverse cumulative impacts.

Conclusions. Proposed rehabilitation work would require repairs of several historic structures as well as the introduction of new features such as guard walls and curbing. The repair or rebuilding of existing guard walls, installation of stone curbing, and culvert headwall repairs would be implemented in a manner to maintain the historic integrity of the design characteristics and craftsmanship and would be compatible with the original method of construction. As a result, the effect on existing historic highway structures would be local, long-term, minor, and adverse. Measures to correct roadway structural and drainage deficiencies would have a long-term beneficial effect on existing guard walls, retaining walls, and other historic features that require protective or rehabilitation measures. Cumulative impacts would be local, long-term, minor, and adverse. Because there would be no major adverse or unacceptable impacts to historic structures, there would be no impairment of park resources or values.

Section 106 Summary. After applying Advisory Council on Historic Preservation criteria of adverse effects (36 CFR Part 800.5, Assessment of Adverse Effects), the NPS concludes that implementation of the Preferred Alternative would have no adverse effect on highway historic structures.

ARCHEOLOGICAL SITES

Affected Environment

Ten archeological sites have been identified within the APE. Identification and documentation of these sites occurred during the *East Side State Route 9 Corridor Survey* implemented prior to the Tunnel Area Road Rehabilitation EA (Betenson 1998). The sites include four prehistoric sites, five historic sites, and one multicomponent site. Of the 10 sites located within the APE, eight are eligible for nomination to the NRHP. These include four prehistoric lithic scatters, three historic sites (including highway construction camps/artifact scatters and a rock quarry associated with construction of the highway), and one multicomponent historic/prehistoric site. The two nonsignificant sites are both abandoned road segments associated with construction of the highway (Betenson 1998).

Impact Intensity Threshold

Section 106 of the NHPA of 1966, as amended (16 U.S.C. 470, et seq.) and its implementing regulations under 36 CFR 800 require all federal agencies to consider effects of federal actions on cultural properties eligible for or listed in the NRHP. In order for an archeological

site to be listed in the NRHP, it must be associated with an important historic event, person(s), or that embodies distinctive characteristics or qualities of workmanship. The thresholds of change for the intensity of an impact on archeological sites are defined in Table 16.

TABLE 16. ARCHEOLOGICAL SITES IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	Impacts would be at the lowest level of detection with neither adverse nor beneficial consequences. The determination of effect for Section 106 would be no adverse effect.
Minor	Alteration of an archeological site would not diminish the overall integrity of the resource. The determination of effect for Section 106 would be no adverse effect. Monitoring may be required if a proposed activity occurs near an archeological site.
Moderate	Alteration of an archeological site would diminish the overall integrity of the resource. The determination of effect for Section 106 would be adverse effect. A PA is executed among the NPS and applicable state or tribal historic preservation officer and, if necessary, the Advisory Council on Historic Preservation, in accordance with 36 CFR 800.6(b). Measures identified in the memorandum of agreement to minimize or mitigate adverse impacts reduce the intensity of the impact under NEPA from moderate to minor.
Major	Alteration of an archeological site would diminish the overall integrity of the resource. The determination of effect for Section 106 would be adverse effect. Measures to minimize or mitigate adverse impacts cannot be agreed on and the NPS and applicable state or tribal historic preservation officer and/or Advisory Council on Historic Preservation are unable to negotiate and execute a memorandum of agreement in accordance with 36 CFR 800.6(b).

Short-term impact—following project completion, effects would remain less than 1 year
Long-term impact—following project completion, effects would remain more than 1 year

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts of the Alternative. Known archeological sites in the APE near the highway would not be affected under the No Action Alternative because there would be no new disturbances.

Cumulative Impacts. Past, present, and reasonably foreseeable future projects, such as road construction and maintenance activities, would have a local long-term minor adverse effect on archeological resources. Rehabilitation of the Kolob Terrace Road is expected to avoid archeological sites. Because the No Action Alternative would not impact archeological sites, there would be no cumulative impacts.

Conclusions. Archeological resources would not be affected under the No Action Alternative. There would be no cumulative impacts. Because there would be no major adverse or unacceptable impacts to archeological resources, there would be no impairment of park resources or values.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. All known archeological sites would be avoided during construction activities. No activity that would have the potential to impact archeological sites would take place outside of the previously disturbed road corridor. Monitoring may be necessary should project design include disturbance near a known archeological site, and the site would be delineated prior to construction. As currently designed, no impacts would occur to archeological sites.

Cumulative Impacts. Past, present, and reasonably foreseeable future projects, such as road construction and maintenance activities, would have a local long-term minor adverse effect on archeological resources. Rehabilitation of the Kolob Terrace Road is expected to avoid archeological sites. Because the Preferred Alternative would not impact archeological sites, there would be no cumulative impacts.

Conclusions. Archeological resources would not be affected under the Preferred Alternative. There would be no cumulative impacts. Because there would be no major adverse or unacceptable impacts to archeological resources, there would be no impairment of park resources or values.

Section 106 Summary. After applying Advisory Council on Historic Preservation criteria of adverse effects (36 CFR Part 800.5, *Assessment of Adverse Effects*), the NPS concludes that implementation of the Preferred Alternative would have no adverse effect on archeological resources.

CULTURAL LANDSCAPES

Affected Environment

Cultural landscapes are defined as "a geographic area including both cultural and natural resources and the wildlife or domestic animals therein associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values" (NPS 1994). Shaped through time by historical land use and management practices, as well as politics and property laws, levels of technology, and economic conditions, cultural landscapes provide a living record of an area's past, a visual chronicle of its history. The dynamic nature of modern human life, however, contributes to the continual reshaping of cultural landscapes, making them a good source of information about specific times and places, but at the same time, rendering their long-term preservation a challenge.

The highway and its associated contributing historic features have been identified by the NPS as a potential cultural landscape and are currently managed as such. Should nomination to the NRHP occur, the cultural landscape type would be a historic designed landscape for its engineering, aesthetic value, and overall historic significance. The highway potential landscape includes the highway and all associated structures such as the tunnels, switchbacks, guard walls, masonry curbing, and masonry culverts; the natural setting; and past and current Native American use manifest in nearby archeological sites. In addition, landscape qualities were incorporated into the original highway design and construction to create the distinctive aesthetics along the road. These measures included design features that located the road in a topographic position to showcase the natural scenery, the construction of a narrow road to provide the motorist with more intimate contact with surroundings, the use of rustic materials, and the sensation of motoring along sinuous curves. All of these elements, along with historical, archeological, and natural features, contribute to the cultural landscape.

Impact Intensity Threshold

Cultural landscapes are the result of the long interaction between people and the land, the influence of human beliefs and actions over time on the natural landscape. The

thresholds of change for the intensity of an impact on the cultural landscape are defined in Table 17.

TABLE 17. CULTURAL LANDSCAPE IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	Impacts would be at the lowest level of detection with neither adverse nor beneficial consequences. The determination of effect for Section 106 would be no adverse effect.
Minor	Alteration of a pattern(s) or feature(s) of the landscape would not diminish the overall integrity of the landscape. The determination of effect for Section 106 would be no adverse effect.
Moderate	Alteration of a pattern(s) or feature(s) of the landscape would diminish the overall integrity of the landscape. The determination of effect for Section 106 would be adverse effect. A PA is executed among the NPS and applicable state or tribal historic preservation officer and, if necessary, the Advisory Council on Historic Preservation, in accordance with 36 CFR 800.6(b). Measures identified in the PA to minimize or mitigate adverse impacts reduce the intensity of the impact under NEPA from moderate to minor.
Major	Alteration of a pattern(s) or feature(s) of the landscape would diminish the overall integrity of the resource. The determination of effect for Section 106 would be adverse effect. Measures to minimize or mitigate adverse impacts cannot be agreed on and the NPS and applicable state or tribal historic preservation officer and/or Advisory Council on Historic Preservation are unable to negotiate and execute a memorandum of agreement in accordance with 36 CFR 800.6(b).

Short-term impact—following project completion, effects would remain less than 1 year
Long-term impact—following project completion, effects would remain more than 1 year

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts of the Alternative. The cultural landscape that encompasses the cultural and natural features along the highway would be impacted, as discussed for Historic Structures, to the extent that contributing historic structural elements would continue to deteriorate in the absence of measures to protect them from future damage. Multiple layers of existing pavement would continue to impact the base of guard walls and stone curbing. The aesthetic quality of the road would diminish with deterioration of road conditions. The No Action Alternative would result in local long-term, minor to moderate, adverse effects on the cultural landscape. Although the park would continue to manage the highway as a potential cultural landscape, its value would be diminished if historic features are not protected.

Cumulative Impacts. Past, present, and reasonably foreseeable use of the highway and continued associated maintenance activities would have local long-term minor adverse impacts on highway historic structures. The numerous historic structures that contribute to the potential cultural landscape have been affected by past and present traffic, visitor use, and maintenance of the roadway. In addition, previous actions that have added new structural features and changes to the landscapes, such as guard walls, stone curbing, parking, and pullouts, have contributed to the current condition of the landscape. Those impacts, in combination with the local long-term, minor to moderate, adverse impacts of the No Action Alternative, would result in local long-term, minor to moderate, adverse cumulative impacts to cultural landscape elements.

Conclusions. There would be adverse impacts to the potential cultural landscape (historic structure element) under the No Action Alternative from deterioration of guard walls, retaining walls, and other features currently being damaged as a result of poor drainage and erosion. Deterioration of highway structural features also diminishes the aesthetic

quality of the road. If left untreated, the effects on the cultural landscape would be local, long-term, minor to moderate, and adverse. Cumulative impacts would be local, long-term, minor to moderate, and adverse. Because there would be no major adverse or unacceptable impacts to the cultural landscape, there would be no impairment of park resources or values.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. Historic structures and archeological sites are components of the cultural landscape of the highway. Since design specifications call for maintaining the historic workmanship and design of the structural elements and no known archeological resources would be disturbed, the impacts to the cultural landscape would be local, long-term, minor, and adverse. There also would be long-term beneficial effect on existing guard walls, retaining walls, and other historic features that receive protective or rehabilitation measures. The comfort station would have a local long-term minor adverse impact on the cultural landscape from introduction of a new element. Proposed improvements would maintain the aesthetic quality, scenic view points, travel pattern, and natural features along the highway. The project would not deter from the potential of the highway to be nominated and included on the NRHP as a cultural landscape.

Cumulative Impacts. Past, present, and reasonably foreseeable use of the highway and continued associated maintenance activities would have local long-term minor adverse impacts on highway historic structures. The numerous historic structures that contribute to the potential cultural landscape have been affected by past and present traffic, visitor use, and maintenance of the roadway. In addition, previous actions that have added new structural features and changes to the landscapes, such as guard walls, stone curbing, parking, and pullouts, have contributed to the current condition of the landscape. Those impacts, in combination with the local long-term minor adverse impacts of the Preferred Alternative, would result in local long-term minor adverse cumulative impacts to landscape elements.

Conclusions. There would be new impacts on the cultural landscape (historic structure element) under the Preferred Alternative. Measures to correct roadway structural and drainage deficiencies would result in local long-term minor adverse impacts on landscape elements, but would also have a long-term beneficial effect on existing guard walls, retaining walls, and other historic features that receive protective or rehabilitation measures. Proposed improvements would maintain the aesthetic quality, scenic view points, travel pattern, and natural features along the highway and would not deter from the potential of the highway to be nominated and included on the NRHP as a cultural landscape. Cumulative effects would be local, long-term minor and adverse. Because there would be no major adverse or unacceptable impacts to the cultural landscape, there would be no impairment of park resources or values.

Section 106 Summary. After applying Advisory Council on Historic Preservation criteria of adverse effects (36 CFR Part 800.5, *Assessment of Adverse Effects*), the NPS concludes that implementation of the Preferred Alternative would have no adverse effect on the potential highway cultural landscape due to the impacts to existing associated historic structures and the addition of new structural features.

VISITOR EXPERIENCE AND RECREATIONAL RESOURCES

Affected Environment

Zion hosted almost 2.7 million visitors in 2008, with most visitors coming between March and October (NPS 2008b). Peak summer visitor use reaches about 360,000 visitors per month from June to August. The park is open year-round, as is the highway. The park uses a shuttle bus system to reduce vehicle traffic along the Zion Canyon Scenic Drive to the terminus at the Temple of Sinawava. Private vehicles are allowed along the highway, but there are vehicle size restrictions because of the narrow 1.1-mile tunnel. Oversized vehicles include nearly all recreational vehicles (RVs), buses, trailers, 5th wheels, and some camper shells. These vehicles require a NPS escort to travel through the tunnel for a fee of $15. Bicycles are allowed on the highway, but bicycles and pedestrians are not permitted through the tunnel. Bicycle riders or pedestrians must arrange their own shuttle to travel through the tunnel.

Recreation activities in Zion including hiking, rock climbing, canyoneering, bird watching, and sightseeing. South and Watchman campgrounds are located in Zion Canyon near the visitor center, and backcountry camping is available via numerous trails. There are no campgrounds or designated backcountry campsites located along the highway. The Canyon Overlook trailhead is located just east of the tunnel and provides a 1-mile scenic hike with views of lower Zion Canyon and Pine Creek Canyon. Visitors along the highway enjoy the scenic views and stop at pullouts for sightseeing, photography, and wildlife viewing. Checkerboard Mesa is a popular scenic stop near the east end of the highway. Many visitors drive the scenic highway as a loop and return back to the Zion Canyon area, while others continue to travel east along State Highway 89 with connections to the Grand Canyon, Bryce Canyon, and other locations in Utah and northern Arizona.

Impact Intensity Threshold

NPS *Management Policies 2006* state that the enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks and that the NPS is committed to providing appropriate high-quality opportunities for visitors to enjoy the parks. Part of the purpose of Zion is to offer opportunities for recreation, education, inspiration, and enjoyment. Consequently, one of the park's management goals is to ensure that visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.

Public scoping input and observation of visitation patterns, combined with assessment of amenities available to visitors under current park management, were used to estimate the effects of the alternatives. Impacts on the ability of visitors to experience a full range of park resources was analyzed by examining resources and objectives presented in the park significance statements, as derived from its enabling legislation. The potential for change in visitor experience proposed by the alternatives was evaluated by identifying projected increases or decreases in access and other visitor uses, and determining whether or how these projected changes would affect the desired visitor experience, to what degree, and for how long. The thresholds of change for the intensity of an impact to visitor experience and recreational resources are described in Table 18.

TABLE 18. VISITOR EXPERIENCE AND RECREATIONAL RESOURCES IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	Changes in visitor experience and recreational resources would be below or at an imperceptible level of detection. The visitor would not likely be aware of the effects associated with the action.
Minor	Changes in visitor experience and recreational resources would be detectable, although the changes would be slight. The visitor would be aware of the effects associated with the action, but the effects would be slight.
Moderate	Changes in visitor experience and recreational resources would be readily apparent. The visitor would be aware of the effects associated with the action and would likely express an opinion about the changes.
Major	Changes in visitor experience and recreational resources would be readily apparent and severely adverse or exceptionally beneficial. The visitor would be aware of the effects associated with the action and would likely express a strong opinion about the changes.

Short-term impact—occurs only during project construction
Long-term impact—continues after project construction

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts of the Alternative. There would be no change in the fundamental nature and quality of the visitor experience or recreation opportunities along the highway under the No Action Alternative. The highway would remain open and visitors would continue to have access to park resources. As roadway conditions continue to deteriorate, periodic maintenance projects would require traffic delays at random times and locations, which would inconvenience visitors. Roadway conditions would deteriorate to the point that the quality of the visitor experience is diminished from a visibly damaged road, failed guard walls, or deterioration of other structural features. Driving and recreational experiences, such as bike riding, would decline due to the poor condition of the road surface. Effects on the visitor and recreation experience under the No Action Alternative would be local, long-term, minor, and adverse.

Cumulative Impacts. Original construction of the highway provided visitors an opportunity to explore the eastern side of the park and other destinations. Past and ongoing road maintenance and other improvement projects have allowed visitors to enjoy the park year-round. Planned future prescribed burning on the east side of the park would result in smoke and temporary visibility issues along the highway that would affect visitor access or activities. Visitors would benefit from implementation of measures such as improved parking, better communication, regional transportation coordination, and other actions to improve the operations of the Zion Canyon transportation system. Rehabilitation of the Kolob Terrace Road would improve the safety and travel conditions for visitors. Improvements to park roads and the Zion Canyon transportation system would have a cumulative beneficial effect to visitors and recreation. Utah Department of Transportation improvements to State Route 9 between Hurricane and the park's South Entrance are intended to improve travel conditions and safety. Implementation of some of the improvements to State Route 9 could result in traffic delays for visitors. Past, present, and reasonably foreseeable future projects would have a long-term beneficial effect on the visitor experience and recreation resources. Those impacts, in combination with the local long-term minor adverse effects of the No Action Alternative, would result in local long-term minor adverse cumulative impacts.

Conclusion. The No Action Alternative would have local long-term minor adverse effects on the visitor experience and recreation resources from ongoing deterioration of the

roadway and structural features that contribute to the quality of the visitor experience and that provide access to recreation resources. Although the highway would remain open to visitor access, as roadway conditions deteriorate, periodic maintenance projects would require traffic delays at random times and locations, which would inconvenience visitors. Cumulative effects would be local, long-term, minor and adverse, but with long-term benefits associated with other transportation improvements in the park and State Route 9 outside the park. There would be no unacceptable impacts to the visitor experience or recreation resources.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. The visitor experience and access to recreation resources would be impacted by construction activities required to rehabilitate the highway. At times, traffic delays and suspensions would inconvenience visitors traveling along the highway, but road improvements would also improve the quality of the visitor experience over the long term.

Planned roadwork on the west side of the tunnel is scheduled for 2010 and would occur primarily between March and October. During this period, temporary traffic delays and suspensions of up to 3 hours from 7 A.M. to 7 P.M. could occur from Monday through Thursday. At other times, traffic delays of up to 1 hour are possible. Planned construction on the east side of the tunnel is scheduled for 2012. Traffic delays for this section of road are expected to be less than 1 hour. Night construction activities on both sides of the tunnel would close the road to through traffic from 9 P.M. to 5 A.M. (times may vary depending on the season and day length) depending on the type of road repairs and the need to close both lanes.

Construction work would cause some visitors to avoid the park or avoid using the East Entrance during periods when traffic is suspended. Visitors traveling through the park via the highway to destinations east or west of the park may decide to use alternative routes to the north (Highways 89 and 14, and I-15) or south of the park (Highways 89, 389, and 59) to reach their destination. Day use visitors in Zion may choose to visit other areas of the park, including destinations along the Zion Canyon Scenic Drive, Kolob Canyon, or the scenic drive along Kolob Terrace, which may result in increased visitor use and crowding at these locations.

As described in Table 3, the park would implement a number of measures to reduce visitor impacts, and maintain the quality of the visitor experience and access to recreation resources during construction. Use of pullouts on the east side of the tunnel for staging may make some of these areas unavailable for visitor use, but access to trails and other sites would typically be made available via an alternative route or detour. Visitors would be informed in advance of construction via a number of sources so they can best plan their schedule and activities. Traffic delays would be kept to a minimum and when delays are expected to last longer than 20 minutes, visitors could be directed to parking areas. Pilot cars could then lead traffic through the construction zone when the road reopens. Temporary road closures and openings would be scheduled on the hour and half-hour to help visitors plan their activities. Tunnel operations for oversized vehicles would be coordinated with construction traffic delays so that visitors would be subject to only one traffic delay when traveling the length of

the highway. Park staff would be posted at traffic stops to answer visitor questions and provide information during traffic delays.

Short-term moderate adverse effects on the quality of the visitor experience would occur at the local, park-wide, and perhaps regional level during periods of construction. While construction activities and traffic delays would temporarily inconvenience visitors, substantial changes in the number of visitors to the park are not expected. Over the long term, the proposed improvements to the condition of the road, pullouts, and the addition of a comfort station would provide a beneficial effect on the quality of the visitor experience and ensure protection of the highway's structural features for visitor enjoyment and safe travel for many years.

Cumulative Impacts. Original construction of the highway provided visitors an opportunity to explore the eastern side of the park. Past and ongoing road maintenance and projects have allowed visitors to enjoy the park year-round. Planned future prescribed burning on the east side of the park in 2009 would result in smoke and temporary visibility issues along the highway that would affect visitor access or activities. Construction work on the east side of the tunnel should not be affected by planned future prescribed burning unless the burns are delayed until 2012 because of weather conditions. Visitors would benefit from implementation of measures such as improved parking, better communication, regional transportation coordination, and other actions to improve the operations of the Zion Canyon transportation system. Rehabilitation of the Kolob Terrace Road also would improve the safety and travel conditions for visitors. Kolob Terrace Road improvements are scheduled for 2014 and would not overlap with construction work on the Zion-Mt. Carmel Highway. Improvements to park roads and the Zion Canyon transportation system would have a cumulative beneficial effect to visitors and recreation. Utah Department of Transportation improvements to State Route 9 between Hurricane and the park's South Entrance also are intended to improve travel conditions and safety. Implementation of some of the improvements to State Route 9 west of the park could occur during the same time as Zion-Mt. Carmel Highway improvements, which may result in multiple traffic delays for visitors. Past, present, and reasonably foreseeable future projects would have a long-term beneficial effect on the visitor experience and recreation resources. Those impacts, in combination with the local, park-wide, and regional short-term moderate adverse impacts and long-term beneficial impacts of the Preferred Alternative, would result in local, park-wide, and regional long-term beneficial cumulative effects.

Conclusion. Traffic delays and suspensions would inconvenience visitors traveling along the highway during construction. In response to construction activities, some visitors may avoid the park, visit other portions of the park, or choose alternate routes for regional travel connections when traffic is suspended along the highway. The park would inform visitors in advance of construction via a number of sources so they can best plan their schedule and activities and minimize impacts. The effect on visitor experience and recreation resources would be short-term, moderate, and adverse at the local, park-wide, and regional level during construction. The Preferred Alternative would provide long-term beneficial effects on the quality of the visitor experience following construction by improving the quality and condition of the highway. Cumulative impacts would be local, park-wide, regional, long-term, and beneficial. There would be no unacceptable impacts to the visitor experience or recreation resources.

SOUNDSCAPES

Affected Environment

An important part of the NPS mission is preservation of natural soundscapes associated with national park units as indicated in NPS Management Policies 2006 and Director's Order – 47: *Sound Preservation and Noise Management*. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all natural sounds within the park, together with the physical capacity for transmitting natural sound through air, water, or solid material. Acceptable frequencies, magnitudes, and durations of human-caused sound varies among NPS units, as well as potentially throughout each park unit, but are generally greater in developed areas and less in undeveloped areas. Zion strives to preserve the natural soundscape associated with the physical and biological resources of the park.

The overall soundscape in Zion is generally quiet with minimal intrusion from human-generated sources except along roads and near high use areas. The soundscape along the highway is influenced primarily by vehicle traffic. About 500,000 vehicles travel the road annually, including about 29,000 oversized vehicles such as buses, RVs, and trucks. In addition, the highway is a popular route for motorcycles, which can generate noise levels higher than other motor vehicles. Park operations, maintenance, and administration activities also contribute to the traffic and noise generated along the highway.

Impact Intensity Threshold

The methodology used to assess noise impacts is consistent with NPS *Management Policies 2006* and Director's Order – 47: *Soundscape Preservation and Noise Management*. Soundscape impacts were evaluated based on anticipated noise levels generated by construction activities in relation to nearby receptors such as campgrounds and residences. The thresholds of change for the intensity of an impact to the soundscape are described in Table 19.

TABLE 19. SOUNDSCAPE IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	Natural sound environment would not be affected, or the effects would be at or below the level of detection and the changes would be so slight that they would not be of any measurable or perceptible consequence to the public experience.
Minor	Effects on the natural sound environment would be detectable, although the effects would be localized, small, and of little consequence to the public experience. Mitigation measures, if needed to offset adverse effects, would be simple and successful.
Moderate	Effects on the natural sound environment would be readily detectable and localized with consequences at the regional level. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.
Major	Effects on the natural sound environment would be obvious and would have substantial consequences to the visitor experience or to biological resources in the region. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

Short-term impact—effects lasting for the duration of the construction period
Long-term impact—effects lasting longer than the duration of the construction period

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts of the Alternative. There would be no change to the existing soundscape under the No Action Alternative. Periodic road maintenance and minor repairs would continue to be conducted when necessary, and the noise associated with these operations would likely involve trucks, graders, backhoes, and other equipment.

Cumulative Impacts. Past actions along the highway, including original construction of the road and repairs and upgrades completed in 2007 at the tunnel portals, introduced temporarily elevated noise levels during construction activities. Planned future prescribed burning on the east side of the park would introduce minor temporary levels of increased noise from fire management activities. Rehabilitation of the Kolob Terrace Road would result in temporary increases in noise levels during construction. None of the past, present, or reasonably foreseeable future actions have or would result in permanent long-term changes that would affect the soundscape. There would be no cumulative effects on the soundscape under the No Action Alternative.

Conclusions. The No Action Alternative would have no effect on the existing soundscape along the highway and there would be no cumulative effects. Because there would be no major adverse or unacceptable impacts to the soundscape, there would be no impairment of park resources or values.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. Rehabilitation activities would result in temporarily elevated noise levels along the highway. The use of equipment for milling the asphalt surface (switchback section) and pulverizing the pavement (both sides of the tunnel) would generate the highest noise levels. Other equipment that would generate noise includes graders, trucks, backhoes, and other smaller pieces of equipment or machinery. No blasting is anticipated. While most of the noise would occur within the highway corridor, truck traffic delivering supplies, asphalt, and removing milled asphalt would increase traffic-related noise along roads leading to the construction area. On the east side of the tunnel, the increased noise would include additional traffic along State Highway 89. On the west side of the tunnel, the increased noise would include additional traffic along Highway 9. In addition, construction traffic would periodically travel to the Watchman staging area. Because the Watchman staging area is located near employee housing and the South Campground, construction traffic to the staging area would generally be limited to daylight hours and would not be earlier than 7 A.M. The park would notify visitors and campers of the hours when construction traffic may occur near the Watchman staging area. The staging area for work on the east side of the tunnel has not been defined, but similar construction access restrictions may be used depending on the location of the facility.

Night construction work on the east side of the tunnel would introduce elevated noise levels during a time when there is very limited highway traffic. However, no campgrounds are in this section of the park and two employee residence is near the East Entrance; therefore, impacts would be minimal. Night construction work on the west side of the tunnel would be closer to park facilities, but would still be at least 1 mile from the South Campground and park employee residences, and about 2.5 miles from Zion Lodge. Construction noise would likely

be buffered by natural terrain and distance, but noise levels would be monitored and night construction activities or schedules would be adjusted, as needed, if visitors are adversely affected.

Effects on the existing soundscape from work activities under the Preferred Alternative would be local, short-term, minor, and adverse. There would be no long-term effects on the soundscape following construction activities and none of the road improvements would increase traffic capacity. A slight reduction in noise levels is possible along the highway from reducing the posted speed limit from 35 mph to 30 mph from the Pine Creek Bridge to County Line Curve. Considerations of noise impacts on wildlife and special status species are addressed under the respective impact topic headings.

Cumulative Impacts. Past actions along the highway, including original construction of the road and repairs and upgrades completed in 2007 at the tunnel portals, introduced temporarily elevated noise levels during construction activities. Planned future prescribed burning on the east side of the park would introduce minor temporarily elevated noise levels from fire management activities. Rehabilitation of the Kolob Terrace Road would result in temporary increases in noise levels during construction. The Kolob Terrace Road work is scheduled for 2014 and is over 10 miles from the highway, so there would be no overlapping impacts to the soundscape. Past, present, and reasonably foreseeable projects would have no long-term adverse impacts on the soundscape. The Preferred Alternative would contribute local short-term minor adverse cumulative effects on the soundscape, but would have no long-term cumulative effects on the soundscape.

Conclusions. The Preferred Alternative would result in local short-term minor adverse effects on the soundscape in the vicinity of the highway from construction activity and traffic, but would have no long-term adverse effect. A slight reduction in noise levels is possible along the highway from reducing the posted speed limit from 35 mph to 30 mph from the Pine Creek Bridge to County Line Curve. Cumulative effects would be local, short-term, minor, and adverse. Because there would be no major adverse or unacceptable impacts to soundscapes, there would be no impairment of park resources or values.

PUBLIC HEALTH, SAFETY, AND PARK OPERATIONS

Affected Environment

Park staff is responsible for the day-to-day maintenance of the highway and park facilities to provide a safe environment for park visitors. Roadwork and maintenance along the highway includes patching, striping, and shoulder work (e.g., vegetation and rock clearing), and culvert and ditch maintenance. Snowplowing and application of traction sand allows the road to remain open throughout the winter. Park staff use the highway to access portions of the park for visitor services, maintenance, law enforcement, search and rescue, resource management, and emergency vehicle access.

Park staff manages oversized vehicle traffic, which must be escorted through the tunnel. Rangers are stationed on each side of the tunnel during daylight hours from mid-March to mid-November to escort oversized vehicles through the tunnel. At other times, visitors must call and make arrangements for an escort. Only one-lane of traffic is open in one direction when oversized vehicles are being escorted. Traffic is stopped on the opposite end of the

tunnel. When the tunnel is clear, the oversized vehicles are released and drive down the center of the tunnel. Once the oversized vehicles are through the tunnel, the other traffic is released.

Impact Intensity Threshold

Public health and safety refers to the ability of the NPS to provide a healthy and safe environment for visitors and park staff, to protect human life, and to provide for injury-free visits and appropriate responses when accidents and injuries occur. Park operations, for the purposes of this EA, refers to the quality and effectiveness of the infrastructure, and the ability of park staff to maintain the infrastructure used in the operation of the park to protect and preserve vital resources and provide for a high quality visitor experience. Facilities included in the analysis include the highway and tunnel, East Entrance Station, trailheads, pullouts, and parking areas. The thresholds of change for the intensity of an impact to public health, safety, and park operations use are described in Table 20.

TABLE 20. PUBLIC HEALTH, SAFETY, AND PARK OPERATIONS IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	The effects would be at low levels of detection and would not have appreciable effects on public health, safety, and park operations.
Minor	The effects would be detectable and would be of a magnitude that would not have appreciable effects on public health, safety, and park operations. If mitigation is needed to offset adverse effects, it would be simple and likely successful.
Moderate	The effects would be readily apparent and result in a change in public health, safety, and park operations that would be noticeable to park staff and the public. Mitigation measures would be necessary to offset adverse effects and would likely be successful.
Major	The effects would be readily apparent, would result in a substantial change in public health, safety, and park operations in a manner noticeable to staff and the public, and would be markedly different from existing operations. Mitigation measures to offset adverse effects would be needed and extensive, and success could not be guaranteed.

Short-term impact—effects lasting for the duration of the treatment action

Long-term impact—effects continuing after the treatment action

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts of the Alternative. The park would continue with ongoing maintenance, traffic control, and administrative operations under the No Action Alternative. Tunnel operations for oversized vehicles would not change. Maintenance work would likely increase as the condition of the highway deteriorates. Public safety concerns associated with deteriorating road pavement, improper roadway cross-slope, curves with a high level of accidents, and poorly located or configured pullouts would not be addressed. The potential for accidents would be similar to existing conditions and may increase as the road continues to deteriorate. Under the No Action Alternative, there would be local long-term minor adverse effects on public health, safety, and park operations.

Cumulative Impacts. Improvements to the highway near the tunnel portals in 2007 implemented several measures to address health and safety issues, including rockfall hazards, relocation of a crosswalk, the addition of a safety median, and rumble strips. Other measures previously implemented to improve park operations included construction of a sidewalk at the Canyon Overlook Trail, parking lot improvements, and replacement of ranger kiosks on each side of the tunnel to improve staging operations for oversized vehicles. Regional

population growth that leads to increased travel on the highway could accelerate deterioration of the highway. Implementation of Zion Canyon transportation system recommendations such as improved parking, better communication, regional transportation coordination, and other actions would be beneficial to park operations and public health and safety. Rehabilitation of the Kolob Terrace Road would improve the safety and travel conditions for visitors. Utah Department of Transportation improvements to State Route 9 between Hurricane and Zion's South Entrance also are intended to improve travel and safety. Past, present, and reasonably foreseeable future projects would have local long-term beneficial effects on public health, safety, and park operations. Those impacts, in combination with the local long-term minor adverse impacts of the No Action Alternative, would not alter the long-term beneficial cumulative impacts of other past, present, and future actions.

Conclusion. The No Action Alternative would result in local long-term minor adverse effects on public health, safety, and park operations by not addressing known safety issues and needed road repairs. The potential for accidents would be similar to existing conditions and may increase as the road continues to deteriorate and the need for maintenance increases. Cumulative effects would remain beneficial. There would be no unacceptable impacts to the park health, safety, and park operations.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. Proposed rehabilitation and improvements would address safety and road maintenance concerns associated with the highway. Improvements to road cross-slope, narrow switchback corners, roadway pavement, and drainage would all improve safety and driving conditions. Milling and grading work to lower the pavement surface near guard walls would improve the effectiveness of guard walls. The addition of guard walls at the Unnamed Curve and Petroglyph Canyon Curve would improve safety. Reconfiguration, abandonment, and minor expansions of pullouts would improve safety for motorists and pedestrians. Reducing the speed limit from 35 mph to 30 mph from Pine Creek Bridge to County Line Curve would reduce the risk of accidents and improve public safety. Park maintenance operations would be substantially improved by implementation of road repairs that reduce the need for continual repairs to deteriorating infrastructure. The service life of the highway, pullouts, guard walls, culverts, and other structural features would be extended by several decades.

Additional demands would be placed on the park staff during construction to coordinate traffic and construction activities. Construction work and traffic delays would cause a disruption in normal traffic patterns, parking, and visitor activities in the park. As previously discussed, the park would take special measures to notify visitors and other stakeholders of the status of the road and potential traffic delays. The park may hire additional temporary staff to better coordinate and communicate with park visitors, contractors, local businesses, and other park staff. To avoid conflicts with routine park operations and shuttle bus operations on the Zion Canyon Scenic Drive, the park would coordinate with the construction contractor for lane or road closures, or other activities that would impact park operations or visitor access. Maintaining a safe environment for park staff, contractors, shuttle bus operators, and visitors during and after construction would be a primary objective.

The Preferred Alternative would have local and park-wide short-term moderate adverse impacts to park operations during construction. Traffic control measures would be implemented to protect visitors. Upon completion of construction work, local long-term beneficial effects on public health, safety, and park operations are expected from roadway improvements.

Cumulative Impacts. Improvements to the highway near the tunnel portals in 2007 implemented several measures to address health and safety issues, including rockfall hazards, relocation of a crosswalk, the addition of a safety median, and rumble strips. Other measures previously implemented to improve park operations included construction of a sidewalk at the Canyon Overlook Trail, parking lot improvements, and replacement of ranger kiosks on each side of the tunnel to improve staging operations for oversized vehicles. Implementation of Zion Canyon transportation system recommendations such as improved parking, better communication, regional transportation coordination, and other actions would be beneficial to park operations and public health and safety. Rehabilitation of the Kolob Terrace Road also would improve the safety and travel conditions for visitors. Kolob Terrace Road improvements are scheduled for 2014 and would not overlap with construction work on the Zion-Mt. Carmel Highway. Improvements to park roads and the Zion Canyon transportation system would have a cumulative beneficial effect to park operations and public health and safety. Improvements to State Route 9 between Hurricane and Zion's South Entrance also would be beneficial to travel and safety. Past, present, and reasonably foreseeable future projects would have local long-term beneficial effects on public health, safety, and park operations. Those impacts, in combination with the local long-term beneficial impacts of the Preferred Alternative, would result in local long-term beneficial effects.

Conclusion. Proposed rehabilitation and improvements would address safety and road maintenance concerns associated with the highway. Improvements to road cross-slope, narrow switchback corners, roadway pavement, and drainage would improve safety and driving conditions and reduce maintenance requirements. Construction work and traffic delays would cause a disruption in normal traffic patterns, parking, and visitor activities in the park and place a greater demand on park staff. The Preferred Alternative would result in local and park-wide short-term moderate adverse effects on park operations. Completion of proposed roadway improvements would result in local long-term beneficial effects on public health, safety, and park operations by improvements to the structural features of the road and safety measures that reduce the potential for accidents. Cumulative effects would be local long-term and beneficial. There would be no unacceptable impacts to park health, safety, or operations.

SOCIOECONOMICS

Affected Environment

Zion is located primarily in Washington and Kane counties Utah. Rockville and Springdale are the closest gateway communities that provide visitor services for those entering the park through the South Entrance. Other Washington County communities that provide tourism-related services include Hurricane, LaVerkin, Virgin, Leeds, and St. George. Although more distant from Zion, the communities of Oderville, Kanab, and Glendale also provide visitor services to travelers using the East Entrance to Zion. With a 2008 population

of about 145,000, Washington County has been one of the fastest growing counties in Utah over the past decade (Utah 2009) with growth in the leisure and hospitality services expected to continue in the future (BEBR 2008). In Kane County, almost 30 percent of all nonfarm jobs are related to the leisure and hospitality sector (BEBR 2008).

A study to evaluate the effect of visitor spending on the local economy as a result of tourism generated by the park determined that visitor spending in 2006 that was directly attributable to the park was $99 million (Stynes 2008). The average visitor group from this study consisted of 2.7 people that spent $246 within a 1-hour drive of the park. Thirty-five percent of the total spending was for lodging, 23 percent was for restaurant meals and bar expenses, 12 percent was for local transportation, 9 percent was for gas and oil, 6 percent was for groceries, and 13 percent was for souvenirs. Direct and secondary effects related to tourism-related spending attributable to park visitation creates about 2,100 jobs, with $49 million in labor income and $72 million in total value added to the local economy.

Impact Intensity Threshold

Socioeconomic issues were identified through the scoping process. Concerns covered by this section include effects on the economic contribution of Zion to the local economies in the gateway communities and the potential effects associated with rehabilitating or not rehabilitating the highway. The thresholds of change for the intensity of impacts to socioeconomics are described in Table 21.

TABLE 21. SOCIOECONOMIC IMPACT AND INTENSITY

Impact Intensity	Intensity Description
Negligible	No effects would occur or the effects on socioeconomic conditions would be below the level of detection.
Minor	The effects on socioeconomic conditions would be detectable. Any effects would be small and if mitigation were needed to offset potential adverse effects, it would be simple and successful.
Moderate	The effects on socioeconomic conditions would be readily apparent. Any effects would result in changes to socioeconomic conditions on a local scale. If mitigation is needed to offset potential adverse effects, it could be extensive, but would likely be successful.
Major	The effects on socioeconomic conditions would be readily apparent and would cause substantial changes to socioeconomic conditions in the region. Mitigation measures to offset potential adverse effects would be extensive and success could not be guaranteed.

Short-term impact—effects lasting for the duration of the treatment action
Long-term impact—effects lasting longer than the duration of the treatment action

Environmental Consequences

No Action Alternative

Direct and Indirect Effects of the Alternative. Under the No Action Alternative, the highway would remain open to traffic and there would be no disruption in visitor travel. The cost to maintain the highway would increase over time as the road continues to deteriorate, and failure to address drainage issues would result in damage to retaining walls, guard walls, and the road substrate, requiring more extensive repairs at a greater cost than addressing problems in the near term. Although immediate impacts to tourism or tourist-related spending are unlikely, deteriorating highway conditions would affect visitor attendance. Thus, failure to implement needed road repairs under the No Action Alternative would have regional long-term minor adverse effects on the economy.

Cumulative Impacts. Past road work in Zion and other improvements to park facilities and infrastructure have resulted in short-term construction-related spending and long-term improvements that maintain the park as a popular tourist destination. Implementation of improvements to the Zion Canyon transportation system, rehabilitation of the Kolob Canyon Road, and State Route 9 improvements between Hurricane and the park's South Entrance by the Utah Department of Transportation would result in local and regional construction spending that would benefit the economy. Improvements in transportation system operations and the quality of roads would have a cumulative beneficial effect to the regional economy from measures that add to the quality of the visitor experience. Traffic delays during implementation of road improvements could deter some visitors, but substantial impacts to visitor numbers or spending are unlikely. Past, present, and reasonably foreseeable future projects would have regional long-term beneficial effects on socioeconomics. Those impacts, in combination with the regional long-term minor adverse cumulative impacts of the No Action Alternative, would result in regional long-term beneficial cumulative effects.

Conclusion. The No Action Alternative would have regional long-term minor adverse effects on the economy from increased road maintenance costs and potential adverse effects on visitor attendance as the road deteriorates. Cumulative effects would remain beneficial. There would be no unacceptable impacts to socioeconomics.

Preferred Alternative—Rehabilitate Highway

Direct and Indirect Impacts of the Alternative. Implementation of the Preferred Alternative would result in construction-related spending of about $6 million for Phase I in 2010 and $7.0 million in 2012 for Phase II construction. Construction expenditures would be used for labor, supplies, equipment, and other services. Labor is likely to come from local communities in Washington and Kane counties. Secondary economic effects from construction-related spending also would generate economic benefits to the region. Construction-related spending would result in short-term beneficial effects on the regional economy.

Construction activity and traffic delays would deter some visitors from coming to Zion or traveling on the highway. As described in Table 3—Mitigation Measures—Visitor Experience, the park would implement a number of actions to minimize impacts to park visitors during construction. Chief among these measures would be clearly and accurately communicating to the public the status of construction work and the timing of traffic delays or suspensions. While some park visitors may be inconvenienced during construction, no substantial change in visitor attendance is anticipated. All of the park campgrounds, shuttle bus service, and attractions along the Zion Canyon Scenic Drive, Kolob Canyon, and Kolob Terrace would remain open and accessible. The Preferred Alternative would result in regional short-term minor adverse effects on the economy if visitor numbers decrease during construction. Over the long term, highway improvements would provide beneficial economic effects on regional businesses from road improvements that increase the quality of the visitor experience. Maintaining the quality of the highway and the visitor experience contributes to the number of park visitors and tourist-related spending.

Cumulative Impacts. Past roadwork in Zion and other improvements to park facilities and infrastructure have resulted in short-term construction-related spending and long-term improvements that maintain the park as a popular tourist destination. Implementation of

improvements to the Zion Canyon transportation system, rehabilitation of the Kolob Canyon Road, and State Route 9 improvements between Hurricane and the park's South Entrance by the Utah Department of Transportation would result in local and regional construction spending that would benefit the economy. Improvements in transportation system operations and the quality of roads would have a cumulative beneficial effect to the regional economy from measures that add to the quality of the visitor experience. Traffic delays during implementation of road improvements could deter some visitors, but substantial impacts to visitor numbers or spending are unlikely. Kolob Terrace Road rehabilitation would not occur during the same year as Zion-Mt. Carmel Highway improvements. Past, present, and reasonably foreseeable future projects would have regional long-term beneficial effects on socioeconomics. The Preferred Alternative would contribute short-term beneficial cumulative economic effects from construction-related spending, but regional short-term minor adverse cumulative effects to the extent that visitor attendance decreases. The long-term beneficial effects of the Preferred Alternative, when combined with previous and future road and infrastructure improvements in Zion and nearby roads, would result in beneficial cumulative effects on the regional economy.

Conclusion. The Preferred Alternative would have regional short-term beneficial effects on the economy from construction-related spending and employment. Traffic delays would deter some visitors from coming to the park resulting in regional short-term minor adverse economic impacts. While some park visitors may be inconvenienced during construction, no substantial change in visitor attendance is anticipated. All of the park campgrounds, shuttle bus service, and attractions along the Zion Canyon Scenic Drive, Kolob Canyon, and Kolob Terrace would remain open and accessible. Long-term socioeconomic effects would be beneficial to regional businesses from improvements to the quality of the visitor experience along the highway. Cumulative effects would be regional, long-term, and beneficial. There would be no unacceptable impacts to socioeconomics.

CONSULTATION AND COORDINATION

SCOPING/CONSULTATION

A press release describing the proposed action initiated public scoping on November 10, 2008 (Appendix A). The park also sent letters describing the proposed action and asking for comments to 100 interested individuals; organizations; state, county and local governments; and federal agencies. American Indian tribes (The Navajo Nation, Kaibab Band of Paiute Indians, Las Vegas Paiute Tribe, Paiute Indian Tribe of Utah, Moapa Band Paiute Tribe, Shivwits Paiute Band, Skull Valley Goshute Tribe, Goshute Indian Tribe, Pueblo of Zuni, Hopi Tribe, Northern Ute Tribe) were also sent an information letter on November 10, 2008, describing the project and asking for comments.

The Utah SHPO was notified of the project by letter dated November 10, 2008, and early input into the project was solicited. The park will coordinate with the SHPO in the development of mitigation measures for historic structures. This EA was forwarded to the Utah SHPO for review and comment.

The park contacted the USFWS in November 2008 to discuss the level of consultation needed for potential effects on threatened and endangered species for the proposed project. In April 2009, the park initiated formal consultation with the USFWS. The USFWS will review this EA to determine if they concur with the park's findings of effect and whether additional conservation measures are needed to protect listed species.

Agencies and organizations contacted to assist in identifying issues and providing an opportunity to review or comment on this EA include, but are not limited to, the following:

Federal Agencies

Bureau of Land Management
- Arizona Strip Field Office
- Cedar City Field Office
- Grand Canyon-Parashant National Monument
- Grand Staircase-Escalante National Monument
- Kanab Field Office
- St. George Field Office
- Utah State Office
- Vermilion Cliffs National Monument

National Forest Service
- Dixie National Forest
- North Kaibab Ranger District

National Park Service
- Bryce Canyon National Park
- Capitol Reef National Monument
- Cedar Breaks National Monument
- Glen Canyon National Recreation Area
- Grand Canyon National Park
- Pipe Spring National Monument
- Utah State Coordinator

U.S. Army Corps of Engineers
U.S. Environmental Protection Agency Region VIII
U.S. Fish and Wildlife Service

Congressional Representatives

Senator Orrin Hatch
Senator Robert Bennett
Representative James Matheson
Representative Jason Chaffetz
Utah State Senate, Dennis Stowell
Utah State Senate, Stephen Urquhart
Utah House of Representatives, Bradley Last
Utah House of Representatives, David Clark
Utah House of Representatives, Evan Vickers
Utah House of Representatives, Don Ipson
Utah House of Representatives, Mike Noel

State Agencies

Coral Pink Sand Dunes State Park
Utah Division of Drinking Water
Utah Division of Water Resources
Utah Division of Wildlife Resources
Utah Office of the Governor
Utah School and Institutional Trust Lands Administration
Utah State Clearinghouse
Utah State Historic Preservation Officer

Local Agencies

Five County Association of Governments
Iron County Commissioners
Kanab Chamber of Commerce
Kane County Commissioners
Kane County Water Conservancy District
Mayor of Cedar City, UT
Mayor of Colorado City, AZ
Mayor of Hildale, UT
Mayor of Hurricane, UT
Mayor of Kanab, UT
Mayor of Kanarraville, UT
Mayor of LaVerkin, UT
Mayor of New Harmony, UT
Mayor of Orderville, UT
Mayor of Panguitch
Mayor of Rockville, UT
Mayor of St. George, UT
Mayor of Springdale, UT
Mayor of Virgin, UT
Mayor of Washington

Southern Utah Kane County Office of Tourism
Springdale Planning Commission
Washington County Commissioners
Washington County Convention and Visitors Bureau
Washington County Water Conservancy District

American Indian Tribes

Goshute Indian Tribe
Hopi Tribe
Kaibab Band of Paiute Indians
Las Vegas Paiute Tribe
Moapa Band Paiute Tribe
Navajo Nation
Northern Ute Tribe
Paiute Indian Tribe of Utah
Pueblo of Zuni
Shivwits Paiute Band
Skull Valley Goshute Tribe

Organizations and Businesses

Grand Canyon Trust
National Parks and Conservation Association
Partners in Parks
Salt Lake Tribune
Sierra Club
Southern Utah Wilderness Alliance
The Nature Conservancy
The Spectrum

Area Libraries

Browning Library, Dixie State College
Kanab City Library
Panguitch library
Southern Utah University Library
Washington County Library, Hurricane Branch
Washington County Library, Springdale Branch
Washington County Library, St. George Branch

COMPLIANCE WITH FEDERAL AND STATE REGULATIONS

The NPS and FHWA would comply with all applicable federal and state regulations when implementing the Preferred Alternative to rehabilitate the highway. Permitting and regulatory requirements for the Preferred Alternative are listed in Table 22.

TABLE 22. ENVIRONMENTAL COMPLIANCE REQUIREMENTS

Agency	Statute, Regulation, or Order	Purpose	Project Application
Federal			
National Park Service	National Environmental Policy Act	Applies to federal actions that may significantly affect the quality of the environment.	Environmental review of proposed action and decision to prepare a FONSI or EIS.
	National Historic Preservation Act, Section 106	Protection of historic and cultural.	The park is consulting with the SHPO to address anticipated effects and mitigation for cultural resources.
	Executive Order 11990, Protection of Wetlands	Requires avoidance of adverse wetland impacts where practicable and mitigation, if necessary.	Minor wetland disturbance in roadside ditch.
	Executive Order 11988, Floodplain Management	Requires avoidance of adverse floodplain impacts where practicable and mitigation, if necessary.	No floodplains present.
	NPS Order No. 77-2 Floodplain Management	Protection of natural resources and floodplains.	No floodplains present.
U.S. Army Corps of Engineers (Corps)	Clean Water Act – Section 404 Permit to discharge dredge and fill material	Authorizes placement of fill or dredge material in waters of the U.S. including wetlands.	The park would seek a Nationwide 404 Permit for drainage work in a roadside ditch that seasonally supports wetlands.
U.S. Fish and Wildlife Service	Endangered Species Act	Protection of federally listed threatened or endangered species.	The park consulted with the USFWS as part of the NEPA process.
State of Utah			
Utah Division of Water Quality	Utah Pollutant Discharge Elimination System (UPDES) Storm Water General Permit for Construction Activities	Erosion control and protection of water quality.	A storm water pollution prevention plan would be developed prior to grading and surface disturbances.
	UPDES General Permit for construction dewatering	Water quality protection associated with discharge of intercepted ground water.	A permit application would be submitted if excavation activities anticipate the interception and discharge of ground water.

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APPENDICES

Appendix A — Scoping Notice

United States Department of the Interior

NATIONAL PARK SERVICE
Zion National Park
Springdale, Utah 84767

IN REPLY REFER TO: L7617 & D30 (ZION/RM&R)

November 10, 2008

Subject: Zion Mt. Carmel Highway Rehabilitation

Reference: Request for Comments on Proposal (Scoping Comments)

Dear Interested Party:

Zion National Park (ZION) is beginning an environmental assessment (EA) to evaluate the potential impacts from the proposed rehabilitation of the Zion Mt. Carmel Highway within the park. The EA will be prepared in compliance with the National Environmental Policy Act (NEPA). The proposed project would be to rehabilitate, restore and resurface approximately 9 miles of road from Canyon Junction to the East Entrance (excluding the Zion Mt. Carmel Tunnel).

The road was completed in 1930 and since then has only had routine cyclic maintenance including asphalt patches, crack-sealing and chip-sealing. Because of environmental effects (rain, snow, heat), heavy traffic, and time the road has deteriorated.

The proposed project is planned for two years. The first year would focus on the road from Canyon Junction to the west entrance into the tunnel and is proposed for fall 2009. The second year would complete the project from the east entrance to the tunnel to the east park boundary and is proposed for fall 2011.

There would be no widening, or realignment of the roadway off of the existing road bench. However, culvert relocation or rehabilitation, as well as the improvement of drainage channels to existing culverts may require disturbance in new areas. Pullouts could be modified or reconfigured, closed, and some existing dirt pullouts could be paved. The project would also include geotechnical and drainage improvements, particularly in the switchback section of the roadway below the tunnel. Specific safety issues would be reviewed and improvements would be identified.

Pavement rehabilitation would likely involve in-place recycling of the existing deteriorated pavement, followed by an overlay of new asphalt paving. The new pavement would later be covered with a red cinder chip-seal. Areas with soft or poorly drained sub-grade may be excavated and replaced with better foundation materials. The numerous historic retaining walls and guard-walls along the route would be assessed for stabilization and preservation.

The National Park Service (NPS) encourages public participation throughout the NEPA process. The public will have two opportunities to comment on this project: first during scoping (now), and again following the release of the EA. We are currently in the scoping phase of this project and invite you to submit your comments.

If you wish to submit comments during scoping we encourage you to do so online at http://parkplanning.nps.gov/zion, select the link for Zion Mt. Carmel Highway Road Rehabilitation. Comments may also be mailed to:

Zion National Park
Zion Mt. Carmel Road Rehabilitation
Springdale, UT 84767

Please submit all comments before December 11, 2008.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

We appreciate your input on this project. If you have any questions, please contact Kezia Nielsen, Environmental Protection Specialist, at kezia_nielsen@nps.gov or (435) 772-0211.

Sincerely,

Jock F. Whitworth
Superintendent

As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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