

National Park Service
U.S. Department of the Interior

Death Valley National Park
California



Bonnie Clare Road Reconstruction Environmental Assessment

November 2017



Bonnie Clare Road Reconstruction Death Valley National Park

Environmental Assessment

SUMMARY

The National Park Service (NPS), in cooperation with the Federal Highway Administration (FHWA), is proposing to reconstruct approximately 7.6 miles of Bonnie Clare Road in Death Valley National Park (park) from the park boundary at the Nevada-California border to its intersection with Ubehebe Crater Road. The proposed project is needed because the majority of this section of Bonnie Clare Road was damaged or destroyed by flooding in October 2015.

This Environmental Assessment (EA) evaluates two alternatives: a no action alternative and the NPS's preferred alternative. Under the no action alternative, the road would not be reconstructed and would remain closed to the public. Under the preferred alternative, the reconstructed road would have two 10-foot-wide paved travel lanes, each with a 1-foot shoulder. From the existing water intake facility to Scotty's Castle (approximately 1.5 miles), a water line and utility lines would be placed beneath one travel lane of the road. A dirt berm that protects the water intake facility also would be repaired and fortified to divert future flood flows away from the spring house and other features at the existing water intake facility. The reconstructed road would generally follow the alignment of the pre-flood road, with some modifications as needed to elevate the road above the new flow line of Grapevine Canyon. Buried concrete Jersey barriers, riprap embankment protection, and some minor stream realignment and restoration also would occur to make the reconstructed road more resilient against future floods.

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 the objectives of the proposal, (2) evaluates potential issues and impacts on resources and values, and (3) identifies mitigation measures to lessen the degree or extent of these impacts. See also *Appendix A: CEQA Mandatory Findings of Significance* for an analysis of impacts pursuant to the California Environmental Quality Act (CEQA; Appendix A).

Resource topics analyzed in detail include cultural landscapes, wetlands and floodplains, special status species, and visitor use and safety. All other resource topics were dismissed because the proposed project would have little or no impact on those resources. Public scoping was conducted in accordance with NEPA.

Public Comment

If you wish to comment on this EA, you may post comments online at <http://parkplanning.nps.gov/deva> or mail or hand deliver comments to Superintendent, Death Valley National Park, P.O. Box 579, Death Valley, CA 92328. This EA will be on public review for a minimum of 30 days.

Before including your address, phone number, email 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. Comments will not be accepted by fax, by email, or in any other ways than those specified above. Bulk comments in any format (hard copy or electronic) submitted on behalf of others will not be accepted.

CONTENTS

SUMMARY	I
INTRODUCTION	1
Purpose and Need	1
Issues and Impact Topics.....	3
Issues and Impact Topics Retained for Further Analysis.....	3
Impact Topics Dismissed from Further Analysis	4
ALTERNATIVES	8
Alternative A—No Action	8
Alternative B—Reconstruct Bonnie Clare Road (Proposed Action and Preferred Alternative).....	9
General Description of Road Reconstruction.....	9
Milepost 0.0 (California/Nevada State Line) to Milepost 3.7.....	12
Milepost 3.7 to Milepost 6.1 (Adjacent to Death Valley Scotty Historic District and Scotty’s Castle)	12
Milepost 6.1 to Milepost 7.6 (Below Scotty’s Castle).....	13
Spring House Berm and Test Well.....	14
General Construction Schedule.....	15
Wetland Compensation	15
Mitigation Measures.....	20
Alternatives Considered and Dismissed	23
Replace Bonnie Clare Road on Original Alignment with Gravel Surface.....	23
Reconstruct Bonnie Clare Road on Original Alignment with Paved Surface	23
Relocate Bonnie Clare Road Adjacent to New Wash Edge and Elevate the Alignment 5 Feet above Anticipated Flow Line.....	23
Relocate Bonnie Clare Road Out of the Flood Zone.....	24
Close the Road	24
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES	25
Cumulative Impact Scenario	25
Cultural Resources	26
Affected Environment.....	26
Environmental Consequences	31
Floodplains and Wetlands.....	35
Affected Environment.....	35
Environmental Consequences.....	37
Special Status Wildlife Species	42
Affected Environment.....	42
Environmental Consequences	44

Visitor Use and Safety	46
Affected Environment.....	46
Environmental Consequences	46
CONSULTATION AND COORDINATION.....	49
Scoping.....	49
Consultation.....	49
SHPO and Tribal Consultation.....	49
U.S. Fish and Wildlife Service	50
U.S. Army Corps of Engineers	50
Lahontan Regional Water Quality Control Board	50
Agencies and Persons Consulted	50
List of Preparers	52
REFERENCES	54
APPENDIXES.....	57
LIST OF TABLES	
Table 1. Issues and impact topics retained for further analysis.....	3
Table 2. Impact topics dismissed from further analysis.....	4
Table 3. Mitigation measures	20
Table 4. Impacts on wetlands.....	40
Table 5. Special status wildlife species with the potential to occur in the analysis area.....	42
LIST OF FIGURES	
Figure 1. Bonnie Clare Road reconstruction project area.....	2
Figure 2. Alternative B—reconstruct Bonnie Clare Road, typical sections.	10
Figure 3. Alternative B—reconstruct Bonnie Clare Road, typical sections.	11
Figure 4. Typical spur detail.	16
Figure 5. Stream-training structures.....	17
Figure 6. Alternative B—Spring House berm.....	18
Figure 7. Alternative B—test well.....	19
Figure 8. Bonnie Clare Road in Grapevine Canyon, February 2017.....	38
LIST OF APPENDIXES	
Appendix A California Environmental Quality Act Compliance	
Appendix B Floodplain and Wetland Statement of Findings	
Appendix C Best Management Practices	
Appendix D State Historic Preservation Office Correspondence	

INTRODUCTION

The National Park Service (NPS), in cooperation with the Federal Highway Administration (FHWA), is proposing to reconstruct approximately 7.6 miles of Bonnie Clare Road in Death Valley National Park (park) from the park boundary at the California/Nevada border to its intersection with Ubehebe Crater Road and the Grapevine Ranger Station (Figure 1). Bonnie Clare Road serves as an access point for the northeastern portion of the park and is the most direct travel route for visitors coming from northern Nevada. The road provides access to the Grapevine Mountain Range in the park, which includes historic Scotty's Castle and several backcountry sites.

In 2012, an environmental assessment (2012 EA) and Finding of No Significant Impact (FONSI) were prepared for the reconstruction and resurfacing of Bonnie Clare Road through Grapevine Canyon from the park boundary at the California/Nevada border to the intersection with Ubehebe Crater Road (NPS 2012a, NPS 2012b). Bonnie Clare Road was reconstructed in 2013 to address extensive deterioration of the road surface and improve the safety of the road. In October 2015, heavy rains resulted in flash flooding in Grapevine Canyon that damaged or destroyed the majority of Bonnie Clare Road. Bonnie Clare Road is currently closed from the park boundary at the state line to just north of the Grapevine Ranger Station.

The purpose of this EA is to examine the environmental impacts and cultural resource effects associated with the current proposed action to reconstruct Bonnie Clare Road. The NPS considered revising the 2012 EA; however, the current project includes actions and potential impacts that were not analyzed in the 2012 EA. Therefore, a new EA was prepared. The affected environment for most resources is described in detail in the 2012 EA. Changes to the affected environment since the 2012 EA and FONSI have resulted mainly from the effects of the flooding in October 2015. Where appropriate in this EA, information from the 2012 EA is updated with new information or summarized and incorporated by reference to avoid undue repetition.

Purpose and Need

The purpose of the proposed project is to reestablish a safe and sustainable driving route from the Beatty, Nevada entrance of the park to the North Highway that is resilient to flood damage and cost effective.

The proposed project is needed because the majority of this section of Bonnie Clare Road was damaged or destroyed in October 2015 when the area experienced a major rainstorm and subsequent flash flood. The flood destroyed approximately 70 percent of Bonnie Clare Road, which is currently closed to the public until the road can be reconstructed. In addition, reconstructing the road is critical to the reopening of Scotty's Castle.



Figure 1. Bonnie Clare Road reconstruction project area.

Issues and Impact Topics

Environmental issues (issues) were identified during scoping. Issues are environmental problems, concerns, and opportunities regarding the proposal to reconstruct Bonnie Clare Road, or regarding alternatives to the proposal. The issues describe the relationship between the actions in the proposal and alternatives and the specific resources that would be affected by those actions. The issues are organized by “impact topics,” which are headings that represent the affected resources associated with the issues that are analyzed in detail. As a general rule, issues were retained for consideration and discussed in detail if:

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

Issues and impact topics that meet all or some of these conditions are discussed below under *Issues and Impact Topics Retained for Further Analysis*. If none of the considerations above apply to an issue or impact topic, it was dismissed from detailed analysis as described below under *Impact Topics Dismissed from Further Analysis*.

Issues and Impact Topics Retained for Further Analysis

The issues and corresponding impact topics retained for analysis in this EA are presented in Table 1.

Table 1. Issues and impact topics retained for further analysis.

Issues	Impact Topics Related to the Issues
Components of the cultural landscape in Grapevine Canyon include Bonnie Clare Road, the Upper Vine Ranch Perimeter Fence, Indian Camp, the Historic Entrance to Scotty’s Castle, and Cottonwood Corner (NPS 2012a). Road construction, drainage improvements, construction access, and other project activities could result in impacts on the cultural landscape, including Bonnie Clare Road and Death Valley Scotty Historic District. Because historic structures, historic districts, and the cultural landscape are closely intertwined in the project area, historic structures and historic districts will be addressed under the cultural resources impact topic as contributing features to the cultural landscape.	Cultural Resources
Bonnie Clare Road is within the floodplain of Grapevine Canyon, and vegetated and unvegetated wetlands are present near the road. Road construction, drainage improvements, construction access, and other project activities could result in impacts on wetlands and floodplains.	Wetlands and Floodplains

Potential habitat for special status species, including the federally listed least Bell's vireo (<i>Vireo bellii pusillus</i>) and southwestern willow flycatcher (<i>Empidonax traillii extimus</i>) is present in Grapevine Canyon. Road reconstruction activities could affect these species or their habitat.	Special Status Species
Bonnie Clare Road serves as an access point for the northeastern portion of the park and is the most direct travel route for visitors entering the park from nearby portions of Nevada. Reconstructing the road would allow the road to reopen, resulting in substantial changes to the visitor experience and safety compared to current conditions.	Visitor Use and Safety

Impact Topics Dismissed from Further Analysis

Several potential issues and impact topics were raised during internal and public scoping but were not retained for additional analysis. Using the same considerations noted previously, the interdisciplinary team analyzed these issues and determined they did not warrant more detailed discussion in this EA. Table 2 briefly discusses impact topics with minor effects that were dismissed from further analysis along with a brief explanation of the reasons for dismissal.

Table 2. Impact topics dismissed from further analysis.

Topic	Reason Dismissed
Air Quality and Climate Change	<p>Earthwork and equipment operation during construction would temporarily increase dust and vehicle emissions. Hauling construction and fill material and operating equipment during construction would result in increased vehicle exhaust and emissions (hydrocarbons, nitrogen oxide, and sulfur dioxide emissions), which would be expected to rapidly dissipate. Resource protection measures for dust control would reduce the potential for fugitive dust.</p> <p>Greenhouse gases (GHG) emitted during project construction would consist of truck and equipment exhaust, but emissions would be short-term and would end with the cessation of construction. Any effects of construction-related GHG emissions on climate change would not be discernible at a regional scale, as it is not possible to meaningfully link the GHG emissions of such individual project actions to quantitative effects on regional or global climatic patterns.</p> <p>Restoring historic travel into the park would not increase the amount of vehicular traffic on Bonnie Clare Road. As such, the project would not change historic low levels of GHG or air pollutant generation from vehicles driving into the park over the long term. Therefore, air quality and climate change were dismissed from detailed discussion in this EA.</p>

Topic	Reason Dismissed
Vegetation, including Special Status Plant Species	<p>Pre-flood vegetation in the Grapevine Canyon area is described in detail in the 2012 EA. Vegetation in Grapevine Canyon before the flash floods in October 2015 consisted mostly of desert scrub plant communities including creosote bush (<i>Larrea tridentata</i>), saltbush (<i>Atriplex</i> spp.), and burrobush (<i>Hymenoclea salsola</i>) on the slopes and within the floodplain of the wash (NPS 2012a). Desert scrub vegetation is common in the park, covering about 75 percent of the park landscape (NPS 2002). Most vegetation within the wash was destroyed during the flooding in 2015, and road reconstruction would occur within areas previously disturbed by the flood. Surviving vegetation is located mostly outside of the limits of disturbance for the project.</p> <p>During botanical surveys of the road corridor in April 2010 and April 2011, five plants of littleleaf rockcress (<i>Arabis microphylla</i> var. <i>microphylla</i>), a California 4.3 (limited distribution) species, were observed on a volcanic rock outcrop approximately 0.10 mile west of the eastern terminus of the historic fence in Grapevine Canyon (NPS 2012a). These plants were on an outcrop that was graded during reconstruction of the road in 2013, and are no longer present. No other special status plant species were documented during the surveys.</p> <p>Impacts on desert scrub vegetation would occur at the northern end of the project, where a 1.5-mile section of the road would be realigned up to about 50 feet further from the wash onto an alluvial bench. Vegetation on this alluvial bench was not destroyed during the flash floods in 2015. About 0.37 acre of desert scrub vegetation would be permanently removed by construction of the road. This loss of vegetation would be partly offset by obliterating and revegetating the previous road alignment.</p> <p>Mitigation measures to avoid and minimize impacts on vegetation, including revegetation with native species and control of invasive species, would be implemented as described under <i>Mitigation Measures</i>. Because permanent loss of vegetation would occur to a relatively small area, would affect a plant community that is abundant in the park, and would be partly offset by revegetation of the previous road alignment, this topic was dismissed from detailed discussion in this EA.</p>

Topic	Reason Dismissed
Wildlife	<p>Wildlife occurrence and habitat conditions in the project area are described in detail in the 2012 EA. Grapevine Canyon supports a variety of wildlife species including many mammal, bird, amphibian, and reptile species due to the variety of upland, wetland, and riparian habitats present.</p> <p>Construction activities would result in temporary disturbances to bighorn sheep and other wildlife due to human presence, noise generation, and vibration from heavy equipment that may displace some wildlife during the construction period. Individual reptiles and small mammals could be crushed or buried during earthmoving and road reconstruction activities, and others would disperse into the adjacent habitat, causing competitive stress. When construction is complete, wildlife is expected to return to the area. Reconstruction of the road would occur mostly within previously disturbed areas, except for a 1.5-mile section where the road alignment would be realigned further from the wash onto an alluvial bench, resulting in permanent loss of about 0.37 acre of desert scrub habitat. This loss of habitat would be partly offset by obliterating and revegetating the previous road alignment.</p> <p>Mitigation measures, such as timing restrictions to avoid the bird breeding season, would be implemented to minimize impacts on migratory birds and other wildlife as described under <i>Mitigation Measures</i>. Temporarily disturbed areas would be revegetated following construction. Potential impacts on species of special concern, including the least Bell's vireo and southwestern willow flycatcher, are discussed under <i>Species of Special Concern</i>. Because direct impacts on wildlife would be limited to the construction period and habitat loss would be negligible given the large amounts of similar habitat in the park, this topic was dismissed from detailed analysis in this EA.</p>
Archeological Resources	<p>Archeological resources in the project area are described in detail in the 2012 EA. A new survey of archeological resources conducted in February and March 2017 recorded 17 isolated occurrences and reexamined 20 archeological sites previously recorded along Bonnie Clare Road (Boston Archaeological Consulting et al. 2017). No new sites were encountered during the survey. Bonnie Clare Road would be reconstructed on its previous alignment within previously disturbed areas, except for one 1.5-mile section near the California/Nevada state line, where the road would be relocated to an alluvial terrace further from the wash. This terrace was surveyed in 2017 and no new sites were found (Boston Archaeological Consulting et al. 2017). The project was modified during construction to avoid impacts on known archeological sites. Resource protection measures such as marking and avoiding known sites and monitoring by a qualified archeologist during construction would be implemented to avoid unintentional impacts. Because adverse effects would be avoided by implementing the measures described under <i>Mitigation Measures</i>, including monitoring during construction, this topic was dismissed from detailed analysis in this EA.</p>

Topic	Reason Dismissed
Ethnographic Resources	<p>Road reconstruction work would occur within the Grapevine Canyon Archeological District, for which a Consensus Determination of Eligibility was prepared in 2012 (NPS 2012c). Ethnographic resources of importance to the Timbisha Shoshone Tribe have been identified within the Grapevine Canyon Archeological District and are listed as contributing features to the archeological district.</p> <p>The NPS is consulting with federally recognized tribes traditionally associated with the park, and copies of this EA will be forwarded to the tribes for review or comment. During project design, the proposed road alignment was modified to avoid impacts on known ethnographic resources. A report was prepared to verify and update existing information collected for the 2012 EA and to document concerns and recommendations of the Timbisha Shoshone Tribe (Bengston 2017). Impacts on ethnographic resources would be avoided by implementing the mitigation measures described under <i>Mitigation Measures</i>, including avoiding cuts to the canyon walls and requiring the presence of tribal monitors during construction. Because the project would not involve cuts to the canyon walls and the measures described under <i>Mitigation Measures</i> would be implemented to avoid known ethnographic sites, no impacts on ethnographic resources are anticipated.</p>
Water Resources	<p>Construction activities would result in impacts on water quality in Grapevine Canyon from the introduction of sediment during installation of underdrains at seeps and other construction activities. Mitigation measures described in the <i>Mitigation Measures</i> section would be implemented to capture sediment and minimize these impacts. There would be no long-term impacts on water quality. A small amount of water would be used during construction for dust suppression. Reconstruction of the road would not result in a long-term change in water consumption. For these reasons, this topic was dismissed from detailed analysis in this EA.</p>
Socioeconomics	<p>Project activities would result in construction-related expenditures for labor, supplies, equipment, and material. Construction spending would have a slight beneficial effect on the regional economy. The project would not add additional capacity to Bonnie Clare Road or other travel routes in the park and, therefore, would not result in growth-inducing impacts. There would be no long-term effects on socioeconomics; therefore, this topic was dismissed from detailed analysis in this EA.</p>
Indian Trust Resources	<p>No Indian trust resources are in the park; therefore, this topic was dismissed as an impact topic in this EA.</p>
Environmental Justice	<p>Furnace Creek, Beatty, and other communities near the park contain both minority and low-income populations; however, environmental justice was dismissed as an impact topic because no actions in the alternatives would have disproportionately high health or environmental effects on minority or low-income populations or communities.</p>

ALTERNATIVES

Two alternatives, the no action alternative and the preferred alternative, were carried forward for evaluation in this EA. A number of options for reconstructing Bonnie Clare Road were considered and dismissed (see *Alternatives Considered and Dismissed*).

Alternative A—No Action

The no action alternative describes the conditions that would continue to exist in the project area if no improvements, repairs, or changes in management were made. As previously described, about 70 percent of the 7.6-mile section of Bonnie Clare Road from the state line to Ubehebe Crater Road has been destroyed. This includes about 62 percent of the road that was completely destroyed and another 8 percent that was heavily damaged to the point where partial reconstruction is needed. Fragments and debris from the former road are still present in places. Currently, an informal gravel road, passable with a high-clearance four-wheel-drive vehicle, generally follows the former alignment of Bonnie Clare road in the sections that have been destroyed. Under the no action alternative, the damaged or destroyed sections of Bonnie Clare Road would not be reconstructed. The existing informal gravel road would remain but would not be open to the public. The heavily damaged existing sections of Bonnie Clare Road would not be removed. Although the road would be closed to the public, NPS and other authorized vehicles would continue to access Scotty's Castle from the south for maintenance and security purposes by driving along the damaged road that currently exists.

Alternative B—Reconstruct Bonnie Clare Road (Proposed Action and Preferred Alternative)

General Description of Road Reconstruction

The preferred alternative would reconstruct about 7.6 miles of the road from milepost (MP) 0.0 (the park boundary at the California/Nevada state line) southwest to MP 7.6 (approximately the intersection with Ubehebe Crater Road). Debris from the destroyed road would be incorporated into the roadbed for the reconstructed road or disposed of outside the park as appropriate. A new aggregate base course and new asphalt pavement would be placed to reconstruct the destroyed sections of road (Figure 2 and Figure 3). The reconstructed road would have two 10-foot-wide travel lanes and 1-foot-wide shoulders, for a total paved width of 22 feet, except where noted below.

The reconstructed road would generally follow the previous road alignment and would be modified at some of the curves. Slight realignment of the segments from MP 0.5 to MP 1.1 and from MP 1.1 to MP 2.0 would relocate the road to an alluvial terrace further from the wash and would make the road more resilient to damage from future floods. The roadway vertical profile would remain unchanged for the majority of the project length. New rock and wall cuts would be avoided. Paved ditches with curbs would be constructed or maintained to avoid the need for slope cuts. Paved ditches would be 2 feet wide with a concrete curb. Where the channel bed has dropped, the road would be lowered to prevent the road from impounding water. Sustainable design principles that minimize impacts on the natural environment would be used by building new structures into the natural configuration of the land so that grading and compaction are reduced, existing topography is preserved to benefit natural hydrologic functions, concentrated runoff is minimized, and runoff is evenly distributed to the extent possible.

Features installed to minimize erosion would include revetment mattresses, buried concrete Jersey barriers, and riprap embankment protection installed in select locations to minimize scour of the road from future flows. An underdrain would be installed where a spring emerges under the existing road surface. A staging area would be established at about MP 1.5, and the existing alignment would also be used as needed for staging. General staging would also occur as needed in the “boneyard” in the Grapevine Developed Area. FHWA would likely have an office at the Grapevine Ranger Station during construction.

Clean fill material would be obtained from existing piles of flood debris at the Scotty’s Castle parking lot and in the Grapevine Developed Area. These piles of material would be used during construction until depleted. Additional fill material would likely be needed and would be brought in from off-site commercial sources.

All project activities would be restricted to the Area of Potential Effect for direct effects, as defined in the Section 106 initiation letter submitted to the State Historic Preservation Office (SHPO) on March 29, 2017.

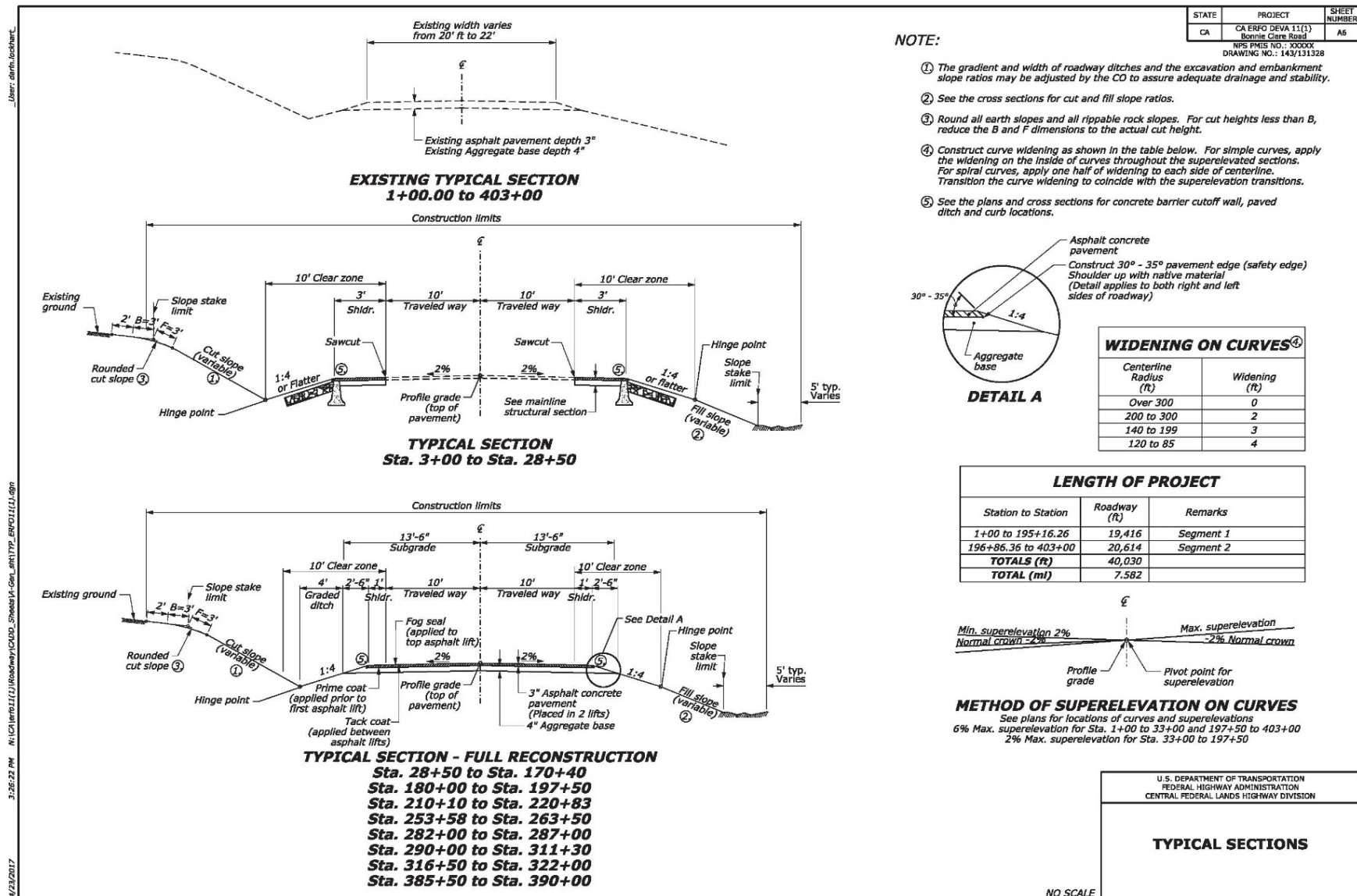
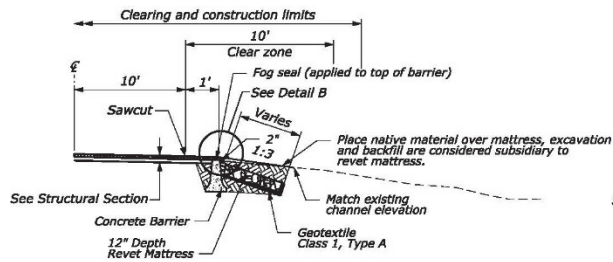
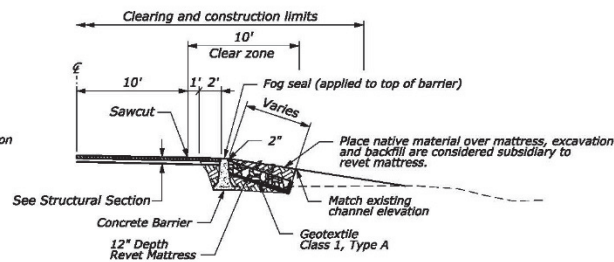


Figure 2. Alternative B—reconstruct Bonnie Clare Road, typical sections.

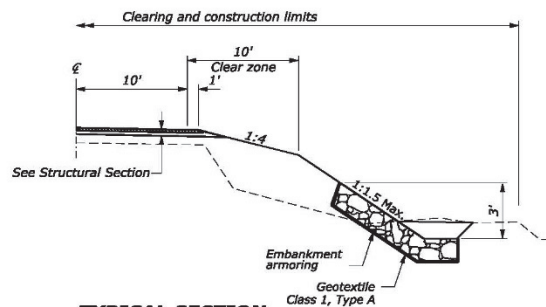
STATE	PROJECT	SHEET NUMBER
CA	CA ERFD DEVA 11(1) Bonnie Clare Road	A7
NPS PMIS NO.: XXXXX DRAWING NO.: 143/131328		



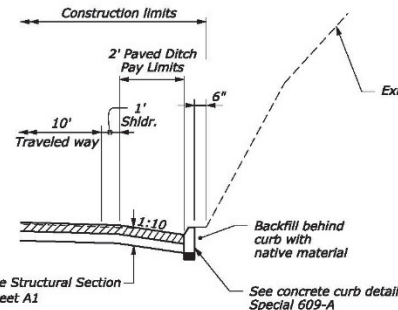
**TYPICAL SECTION
CONCRETE BARRIER CUTOFF WALL
REVE MATTRESS SHOULDER ARMORING**



**TYPICAL SECTION
REVE MATTRESS SHOULDER ARMORING
IN LOCATIONS WITH EXISTING PAVEMENT**
Sta. 3+00 to Sta. 28+50, LT
Sta. 6+00 to Sta. 12+00, RT
Sta. 15+00 to Sta. 28+50, LT
Sta. 316+50 to Sta. 317+50, RT



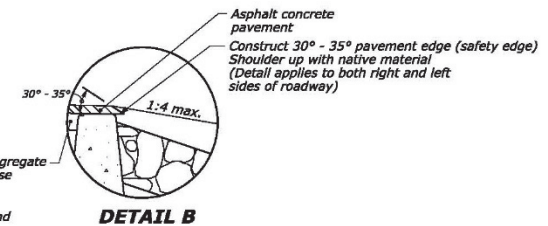
**TYPICAL SECTION
EMBANKMENT ARMORING**



PAVED DITCH AND CONCRETE CURB

NOTE:

1. Excavation for placement of revet (gabion) mattress will not be measured for payment.
2. Use anchor stakes that are 2" dia. X 4' galvanized pipe or 2 1/2" x 2 1/2" x 1#4" x 4' galvanized steel angle iron. Use 6' long anchor stakes for stacked mattresses.
3. Tie all revet mattresses together.
4. Furnish geotextile materials conforming to Subsection 714.01 (a).



DETAIL B

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

TYPICAL SECTIONS

Figure 3. Alternative B—reconstruct Bonnie Clare Road, typical sections.

Milepost 0.0 (California/Nevada State Line) to Milepost 3.7

The existing parking area at the California/Nevada state line entrance was undermined by erosion resulting from the 2015 flood. The existing concrete pad to fill the void beneath the pad created by flood flows would be filled.

The road alignment would be fully reconstructed within this section. Revetment mattresses and buried concrete Jersey barrier would be installed on both sides of the road to protect against future damage to the road from erosion during flood events. Paved ditches with concrete curb would be added in select locations to eliminate cuts to rock walls. Concrete curb would match the design and color of the remaining intact curb. The reconstructed road would follow the previous alignment, with the exception of the segment from MP 0.5 to MP 1.1 and from MP 1.1 to MP 2.0, where the road would be relocated to an alluvial terrace further from the wash.

Three buried boulder grade control structures would be constructed within the channel of Grapevine Canyon Wash just downstream of the road from about MP 3.1 to MP 3.2 to protect the road from future downcutting. The boulder grade control structures would be about 70 to 100 feet long and 10 feet wide.

A staging area would be established at about MP 1.5 near the California/Nevada state line, in an area where the canyon is relatively wide. The road alignment would be shifted about 50 feet to the west, and areas east of the new alignment, consisting mostly of the previous road alignment, would be used for staging materials.

Milepost 3.7 to Milepost 6.1 (Adjacent to Death Valley Scotty Historic District and Scotty's Castle)

This portion of Bonnie Clare Road was not as extensively damaged as the section from MP 0.0 to MP 3.7. Work would consist of partial reconstruction of the road, with ditch reconditioning, embankment repair, and placement of riprap as needed. The road width would remain unchanged from the previous road project in 2012-2013. From MP 3.7 to MP 4.0 and from MP 4.3 to MP 4.8, roadside ditches would be reconditioned and the road embankment would be repaired. The road sections from MP 4.0 to MP 4.3, from MP 4.8 to MP 5.0, and from MP 5.3 to MP 5.9 would be reconstructed and the riprap embankment protection would be placed along the right embankment (southbound). The right lane would be reconstructed for a short section from MP 6.0 to MP 6.1. The reconstructed road would follow the same alignment and would be at the same grade as existed before the flooding in 2015.

An underdrain would be constructed at about MP 4.0 where a spring emerges from under the road surface. The underdrain would be constructed with perforated pipe buried about 5 feet deep, with an outlet pipe to direct the flow to the toe of the road fill on the downstream side of the road.

A water line and utility lines would be placed beneath the southbound travel lane of the road from about MP 3.8 (the existing water intake facility and spring) to about MP 4.5 (near Scotty's Castle). The water line and utility lines would originate at the water intake facility and would tie into the existing water system at Scotty's Castle. The water and utility lines from the water intake

facility to the road (about 350 feet) and from the road to Scotty's Castle (about 1,100 feet) would be placed underground using trenching. After crossing the wash at about MP 4.5, the waterline and utility line would continue via trenching to connect to the existing water vault at Scotty's Castle. The existing temporary aboveground waterline would be removed. The trenched areas would be restored to preconstruction conditions after work is complete. The water line and utility lines would be placed in a 3-foot-wide by 6-foot-deep trench.

The preferred alternative would include reconstructing the damaged portion of fence along Bonnie Clare Road from MP 3.5 to 6.0. The fence would be reconstructed on the alignment that existed prior to the 2015 flood, with a few minor modifications required due to changes in the vertical and horizontal location of the channel bottom resulting from the flood. Reconstruction would proceed in compliance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* and the *Final Fence Preservation Treatment Plan* (NPS 2012d).

At approximately MP 4.7, the bridge at the entrance to Scotty's Castle is threatened by erosion and downcutting of the Grapevine Canyon Wash channel. Proposed work to protect the bridge from future erosion would include:

- Armoring would be placed in the channel from 100 to 200 feet downstream of the bridge and would be buried. The banks of the channel also would be armored to prevent flanking. The armoring would consist of buried articulating concrete blocks (ACBs).
- The channel would be armored with buried ACBs a minimum of 25 feet upstream of the bridge.
- The channel banks at the bridge abutments would be armored with buried ACBs for a minimum of 25 feet upstream and downstream from the bridge.
- A headcut (sudden change in elevation at the leading edge of a gully) about 75 feet upstream of the bridge would be armored with buried ACBs to prevent further erosion.

The total area of disturbance at the bridge would extend about 75 feet upstream of the bridge, 200 feet downstream of the bridge, and 50 feet on either side of the channel.

An existing underdrain at Cottonwood Corner, approximately MP 5.9, would either be left in place or reconstructed in the same way as existed after the 2012-2013 project. A temporary vehicle turnaround area would be established on the east side of the road at Cottonwood Corner. The turnaround would be used only for construction purposes and would be restored after construction is complete. No storage of materials would occur at this site because it is within a side wash to the canyon.

Milepost 6.1 to Milepost 7.6 (Below Scotty's Castle)

The section of the road below Scotty's Castle was not as extensively damaged as the section from MP 0.0 to MP 3.7. Work would mostly consist of ditch reconditioning and embankment repair as needed, and placement of riprap embankment protection. One short section of the road at a low water crossing from about MP 7.3 to MP 7.4 would be reconstructed and protected with revetment mattresses and buried concrete Jersey barrier.

Several stream-training structures would be installed along the road and stream channel edge at about MP 7.4, just upstream of the intersection with Ubehebe Road, to reduce erosion and direct stream flows away from the road and toward the Grapevine Canyon Wash channel (Figure 4 and Figure 5).

- An earthen berm would be constructed on the right side of the road (southbound). The berm would be about 550 feet long, 2 feet high, and 2 feet wide along the top, and would have 2:1 (horizontal: vertical) side slopes.
- A 6-foot-high by 6-foot-wide by 10-foot-long rock feature would be placed on the left side of the road to prevent further erosion in an eroded area. The rock feature would be a dry-stacked rockery designed to mimic a rock outcrop that existed prior to the flood and would prevent water from flowing down the left side of the road and flooding the park facilities at Grapevine.
- An existing ditch would be filled in from the road to the valley wall on the left side of the road, creating a flat surface from the road to the wall.
- An existing berm would be removed on the right side of the road. The existing berm is about 74 feet long and 10 feet wide. A 10-foot-wide channel would be graded to drain water from a low water crossing to the channel.
- Four riprap spurs would be constructed with one end along the eroded channel bank and one end projecting into the channel (Figure 4). The most upstream spur would be 30 feet long and angled 45 degrees to the existing bank. The other three spurs would be 20 feet long and would be perpendicular to the existing bank. Each spur would be 3 feet wide along the top, 5 feet high, and have 2:1 side slopes. Spurs would be constructed of Class 5 riprap.

Spring House Berm and Test Well

A dirt berm that protects the water intake facility by diverting flood flows away from the Spring House and other features at the existing water intake facility would be repaired and fortified (Figure 6). The existing berm is about 2 to 3 feet high and would be reconstructed to be about 6 feet high. The reconstructed berm would be about 367 feet long, 5 feet wide at the top, and 36 feet wide at the base. The berm would tie in with the hillside north of the Spring House and would curve around to the south and west to protect the Spring House, Chlorination Building, and water tanks from flooding. The upstream (east) face of the berm would be protected with a rock-filled gabion basket about 1 foot thick. Access to construct the berm would be along the existing access road to the Spring House at about MP 3.75. Following construction, the access road would be returned to preconstruction conditions.

The park would install a test well near Staininger Spring (Figure 7). The test well would be used to test the feasibility of converting the Scotty's Castle water supply from direct spring capture to a well. This would potentially allow for the restoration of spring flow to support aquatic ecosystems and riparian habitats.

A drill rig would access the well site on the existing maintenance road to the Chlorination Building and Spring House. Staging would be limited to the existing road and parking area at the

water system infrastructure. The well would involve drilling a 14-inch-diameter borehole down 20 feet to allow installation of a 10-foot-long surface casing. Then, drilling will continue below 20 feet with a 10-inch-diameter borehole to a depth of no more than 400 feet. The well would be on a 2-foot-diameter and 4-inch-thick concrete pad. The well would rise 3 feet above ground and would be 10 inches in diameter. Drill cuttings (material removed from the drill hole) would be removed by park maintenance staff and added to the clean fill material stockpiles at Scotty's Castle or at the Grapevine Ranger Station.

General Construction Schedule

Construction would begin in summer or fall of 2018, with completion planned for fall 2019.

Wetland Compensation

Compensation for wetland impacts would be accomplished by reestablishing wetlands in four locations as described in detail in the Floodplain and Wetland Statement of Findings (Appendix B) and in the *Compensatory Mitigation and Monitoring Plan* (FHWA 2017a). Mitigation would include reestablishing spring flow channels, redirecting spring flows to wetland and riparian areas, obliterating abandoned sections of road to reestablish riverine wetlands, and installing vertical mulch to promote revegetation. A total of about 7.8 acres of riverine wetlands would be reestablished (FHWA 2017a). Wetland compensation would be constructed concurrently with reconstruction of the road.

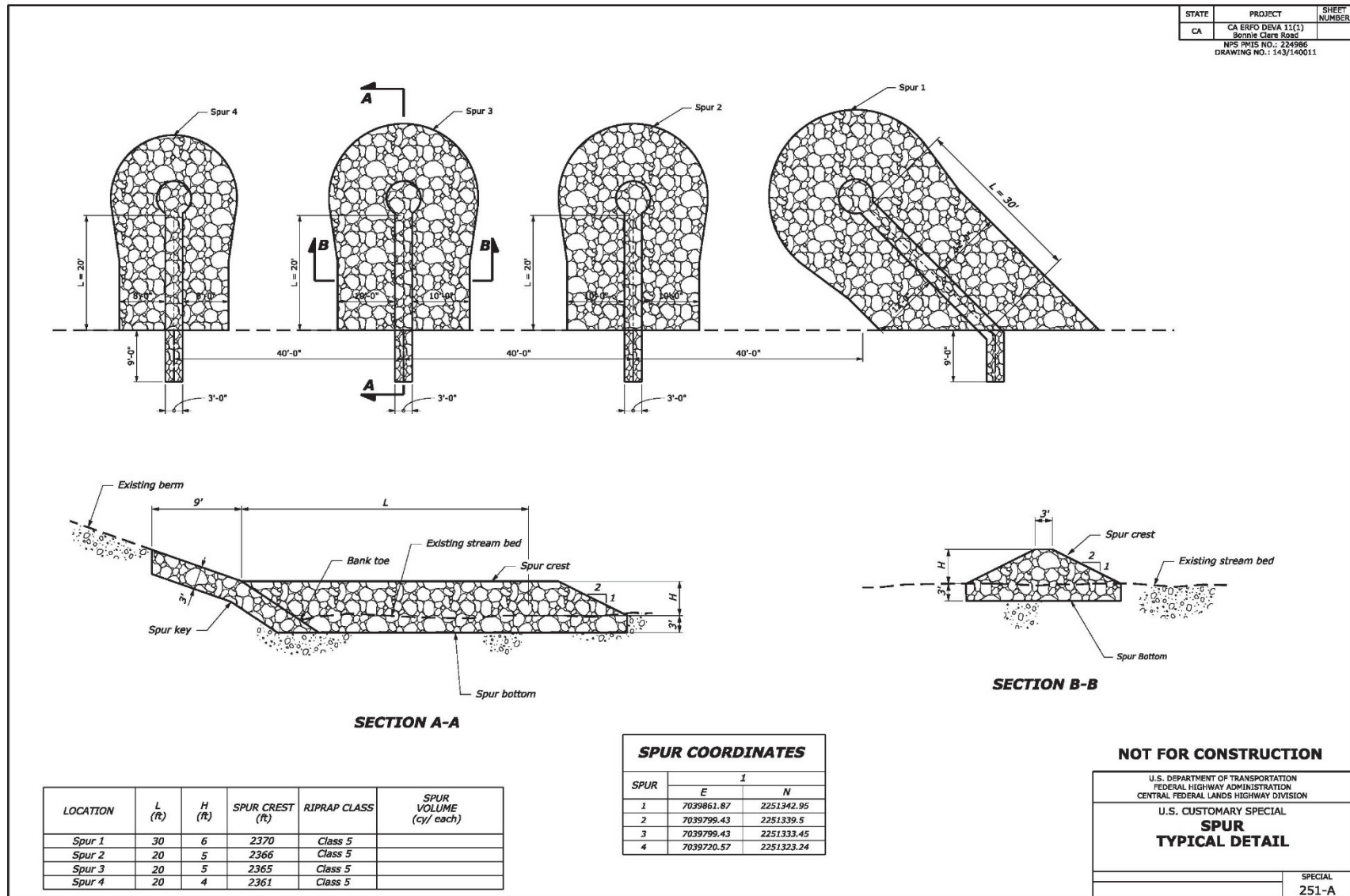


Figure 4. Typical spur detail.

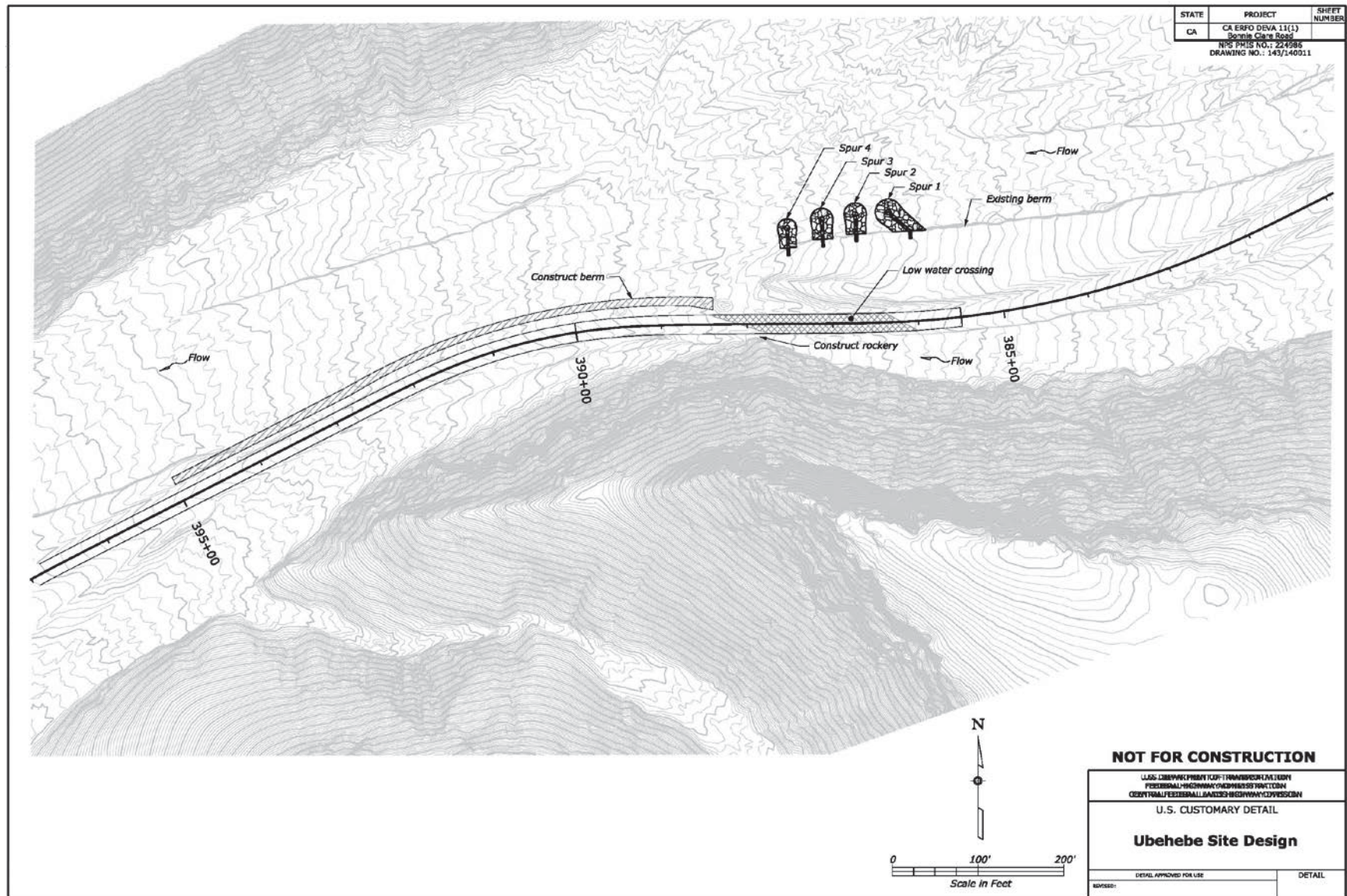


Figure 5. Stream-training structures.

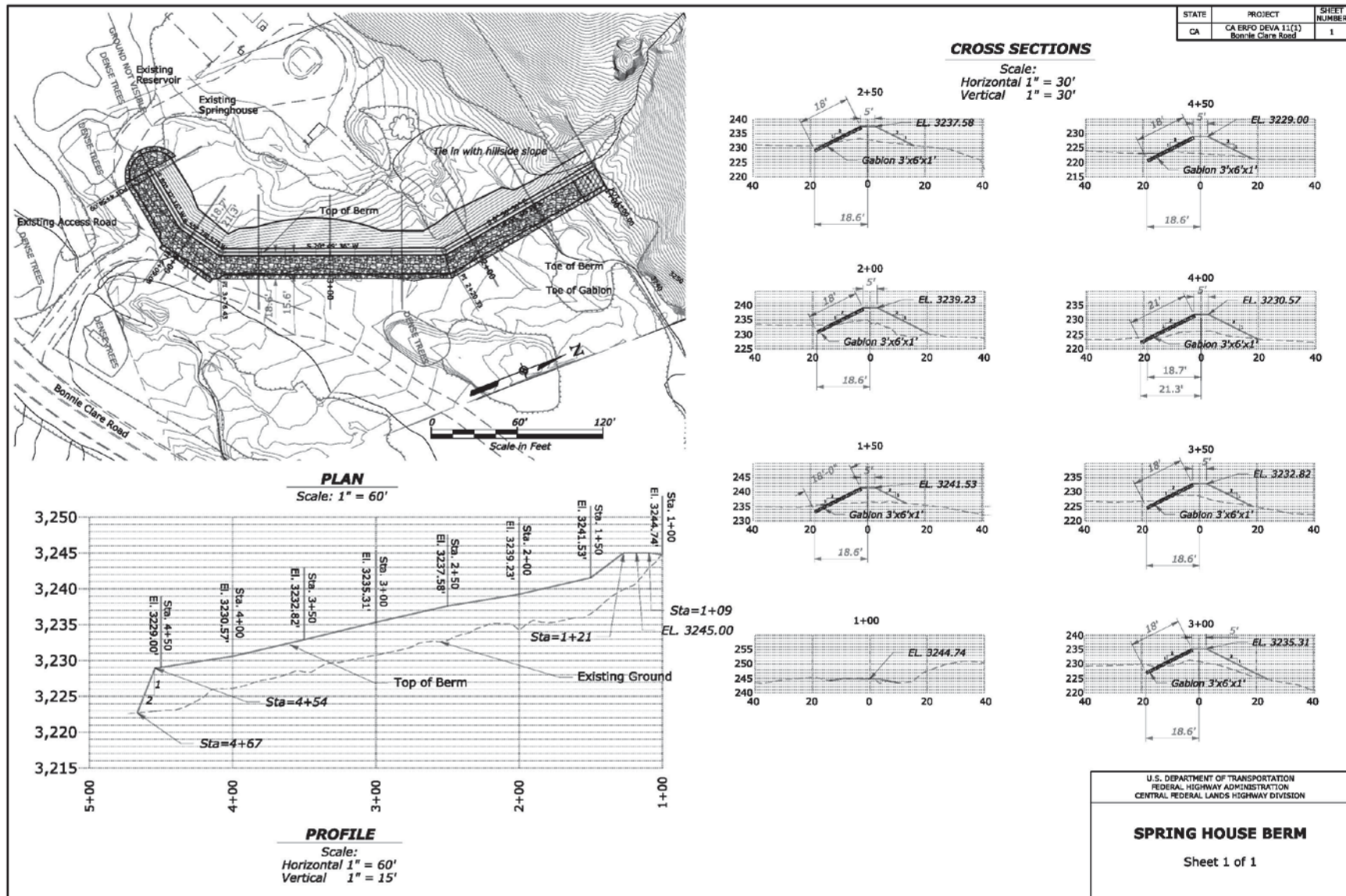


Figure 6. Alternative B—Spring House berm.