2.0 ALTERNATIVES

This chapter describes the alternative development process and the various components of each alternative. Descriptions of the resources potentially affected by the project and an analysis of the potential impacts are provided in Chapter 3.0, Affected Environment and Environmental Consequences.

The primary objectives of trail development in the Sloan Canyon NCA are:

- To provide trail facilities that minimally affect resources
- To provide opportunities for satisfying a range of recreation experiences
- To develop a sustainable trail network so that minimal long-term maintenance is required
- To serve the intended type(s) and level of use

All photos, drawings, and simulations are located at the end of this chapter. (Alternative maps, however, remain in the main narrative section.)

2.1 ALTERNATIVE DEVELOPMENT PROCESS

An ID Team, representing various resources within Sloan Canyon NCA, developed a range of reasonable alternatives for the proposed project. The ID Team identified relevant issues and reviewed concerns presented during the public and agency scoping periods, and then formulated alternatives in response to these issues. As discussed further in Section 2.2, the 2006 Sloan Canyon RMP also provided important guidance for the development of alternatives.

2.1.1 OPPORTUNITIES AND CONSTRAINTS ANALYSIS

Geographic Information Systems (GIS) was used to conduct an opportunities and constraints analysis for the proposed trail network. Steep slopes (>40%), sensitive species habitat, appropriate habitat buffers, and seasonal wildlife habitat restrictions were all considered in the spatial analysis. The result of the opportunities and constraints analysis was a map identifying areas that should be excluded from further consideration for trail location due to site constraints. This exercise helped to narrow the area of consideration. Generally, all areas east of the wilderness boundary and south of the Quo Vadis Mine road (Black Mountain Road) were identified as exclusion and/or avoidance areas. However, these areas would remain open to cross-country travel per the 2006 RMP. Additionally, access to the southern portion of the NCA is limited, and visitation in this area is not expected to increase at the same rate as in areas more central to Las Vegas and Henderson.

2.1.2 STAKEHOLDER AND PUBLIC INVOLVEMENT

As discussed in Section 1.7, early engagement with project stakeholders helped to identify potential use types, frequency of visits, potential visitation levels, potential trail corridors, and network options.

Several project stakeholders, including organized hiking groups and individuals, have a long history of utilizing Sloan Canyon NCA for hiking, equestrian, and other recreational pursuits.

Many of these stakeholders have extensive knowledge of the area, have travelled the extent of the NCA, and were able to provide invaluable feedback on site constraints and opportunities, access areas, as well as informal maps of travel routes and destinations. These hiking routes, maps, and anecdotal accounts from stakeholder engagement were used extensively in the development of the alternatives and the proposed Trails Master Plan.

Stakeholder input, combined with the results of the opportunities and constraints analysis, was valuable in determining trail specifications for certain areas and use types, and for determining where trails should be considered despite the site constraints due to visitor demands. For example, the Black Mountain area was initially identified as an exclusion area due to steep slopes over 40%; however, stakeholder groups and the public identified this area as a high priority destination for future recreational opportunities. As such, a trail to the top of Black Mountain, despite slope constraints, was retained for further consideration (see Section 2.1.1, regarding desired slopes for optimal trail construction).

2.1.3 CONCEPT PLANNING

As described in Section 1.5.2, MEAs provide a framework for identifying BLM's management intent for a particular geographic area and for evaluating future actions and proposals. Each MEA has a set of objectives that describe the physical, social, and managerial setting of the area and provide standards for future management. In order to provide a positive visitor experience, any future actions or improvements within an MEA must be consistent with the established guidelines and expectations.

Based on the results of the constraints analysis, stakeholder engagement, and review of MEAs and trails identified in the 2006 RMP, a series of potential trail network concepts were developed showing a wide range of potential trail corridors, origins and destinations, and linkages and connections. The concept planning phase also considered potential future connections to the North McCullough Road and Anthem trail projects (see Section 1.5.5). Preliminary concept planning efforts resulted in four potential trail network concepts, ranging from no additional trail network development to an approximately 75-mile full network providing extensive access to all areas of the NCA.

In May 2008, the BLM hosted an internal two-day workshop with the trails design team and project stakeholders to review the four concept plans. The workshop included a site review to field-truth portions of the proposed networks and trail locational concepts. A consensus was reached among workshop participants, and approved by the BLM, to move forward with a subset of the four original concepts. (Those concepts not carried forward for further analysis are described in Section 2.3, *Alternatives and Project Elements Considered but Dismissed*.)

2.1.4 SITE RECONNAISSANCE AND CORRIDOR ANALYSIS

In early June 2008, a team of EDAW trail designers and BLM resource staff field-located a series of potential trail corridors. The corridors were defined with a width of approximately 100 feet and were based on the preliminary networks developed in the concept planning phase. A team of wildlife biologists followed the trail planners and surveyed the preliminary corridors for desert tortoise and other site-specific biological constraints. Cultural resources were also surveyed in the field by BLM archaeologists. The purpose of the corridor analysis was to field-verify that all preliminary trail corridors could be developed without unacceptable resource conflicts. Where resource conflicts were identified, the corridors were relocated.

2.1.5 NETWORK REFINEMENT

In October 2008, the EDAW trail design team and BLM resource staff returned to Sloan Canyon to refine the network and determine the exact alignment of all proposed trails within the preliminary corridors surveyed in June 2008. The network refinement field work resulted in the identification of several new trails and/or previously unidentified connections, as well as the incorporation of several existing OHV/motorized social trails to enhance the trail network.

2.2 ALTERNATIVE DESCRIPTIONS

Four alternatives have been developed for the proposed project: Alternative A – No Action, Alternative B, Alternative C, and Alternative D – Proposed Action. The following tables are applicable to each of the four alternatives and are intended to be used in concert with the individual alternative descriptions.

The following tables (Tables 2-1 through 2-4) summarize the mileage by alternative for each of the following attributes: new trail length and site conditions, widths, intended use types, and wilderness/non-wilderness trails.

Table 2-1. New trail length and site conditions (miles).

Alternative	Existing Road	Motorized/ OHV Social Trail	Non-Motorized Social Trail	Natural Wash	Undefined	New Trail Const.	Grand Total
A	2.1	0.7		3.0	1.5		7.3
B	6.6	3.4	3.7	12.3		31.8	57.8
C	9.2	11.0	3.7	12.8		31.8	68.4
D	7.6	11.0	3.3	5.5		17.3	44.8

Table 2-2. Trail widths (miles).

Alternative	2-3ft	4ft	5-6ft	6-8ft	8-12ft
A*					
B	30.8	10.7	8.3	1.3	6.8
C	30.8	12.1	8.3	3.1	14.1
D	6.6	13.3	9.2	3.0	12.5

*Alternative A does not, for the most part, currently exist on the ground. As such, trail widths are not provided.

Table 2-3. Trail use types (miles).

Alternative	Hiking Only	Hiking, Biking, and Equestrian	Hiking and Equestrian
A	3.4	2.5	1.3
B	21.7	16.4	19.7
C	21.7	27.0	19.7
D	15.8	27.0	2.0

Table 2-4. Wilderness and non-wilderness trails (miles).

Alternative	Non-Wilderness	Wilderness
A	3.2	3.9
B	36.6	21.2
C	47.2	21.2
D	40.9	3.9

Individual alternatives are described below in Sections 2.2.1 through 2.2.4. Elements or construction practices common to all action alternatives (Alternatives B, C, and D) are described immediately following the description of Alternative D. Additionally, Project Design Features, design elements that are intended to reduce, avoid, or minimize the potential for impact during the planning process, are listed in this chapter. Unless otherwise noted, it should be assumed that all *Elements Common to Action Alternatives* and *Project Design Features* identified below are fundamental elements of each of the action alternatives.

2.2.1 ALTERNATIVE A – NO ACTION

Alternative A, the No Action Alternative, provides a baseline for comparing the relative changes and effects that would occur with implementation of any action alternative. It considers what may result if the proposed project is not implemented. It is defined as a continuation of existing management practices. Current management plans would continue to guide management activities in the analysis area.

In addition to the McCullough and Anthem trails being developed by the City of Henderson, Alternative A would include the four trails identified in the 2006 RMP and WMP: Cowboy Trail, Hidden Valley Trail, Petroglyph Trail, and an unnamed trail connecting the proposed Quo Vadis trailhead with the North McCullough Road corridor (Map 5). Alternative A would include each of these unimproved routes on the alignments shown in the RMP and WMP.

In most locations, the RMP-proposed route is not discernable on the ground as it was only identified as a potential trail corridor, but not formally established, through the RMP process. No formal signage or wayfinding aids exist within the NCA (including the wilderness); however, unofficial rock cairns have been erected along popular access routes, but do not necessarily reflect the RMP-proposed alignments.

A basic legal description of Alternative A is as follows:
T23S R62E Sections 3, 10, 11, 12; T23S R61E Sections 26, 35; T24S R61E Sections 2, 3, 10.

According to the recreation resource management decision, REC 2, in the 2006 RMP, “Cross-country hiking is allowed in trail-use-only areas until BLM trails are established and in use, after

which some or all of these areas may be restricted to hiking on designated trails" (BLM 2006). Given that no further BLM trails would be established under Alternative A (no trails additional to those identified in the RMP), cross-country travel would still be allowed in all MEAs under this alternative.

Under Alternative A, no additional trail construction, trail improvements, or existing OHV route restoration would occur. All Alternative A trails would remain aligned as shown in the RMP and WMP. Alternative A would include approximately 7.1 miles of unimproved RMP-proposed routes (see Map 5; total mileage does not reflect the City of Henderson proposed trails).

2.2.2 ALTERNATIVE B

Under Alternative B, the BLM would pursue the construction, development, and designation of approximately 58 miles of trails throughout the northeast and northwest portions of the NCA (Dutchman Pass, Black Mountain, and Hidden Valley areas) (Map 6), including trails within the North McCullough Wilderness. This network would consist of existing social trail routes, natural washes, and the construction of new trails in both wilderness and non-wilderness areas (Table 2-4).

A basic legal description of Alternative B is as follows:
T22S R62E Sections 25, 35, 36; T23S R62E Sections 1, 2, 3, 10, 11, 12, 13, 14, 15, 16, 20, 21, 22, 23, 29, 30; T23S R61E Sections 25, 26, 33, 34, 35, 36; T24S R61E Sections 1, 2, 3, 4, 9, 10, 11.

In the Dutchman Pass area, Alternative B would designate a 16-mile network of hiking, biking, and equestrian trails. New trails and loop options in this area would rely extensively on the use of natural washes and existing social routes; however, some new construction would also be necessary in this area. The Alternative B trails in the Dutchman Pass area have been designed to interconnect with the City of Henderson proposed trails and the locations of the Dutchman Pass and Quo Vadis trailheads, as identified in the 2006 RMP. Under Alternative B, the BLM would close and restore unauthorized OHV routes intersecting the Alternative B routes to facilitate appropriate use of the designated trail system. Efforts to close and restore such OHV routes are described in further detail under Elements Common to All Alternatives.

In the Black Mountain area, Alternative B would designate a 12-mile network of hiking only trails. Alternative B proposes a minor realignment to the main Black Mountain summit social trail beginning at the City of Henderson's Shadow Canyon Trailhead. Alternative B also proposes the designation of a new route to the Black Mountain summit on the ridge due north of the existing social trail. Alternative B would also designate a trail to the summit of Park Peak and an interconnecting trail to the location of the Visitor Center, as proposed in the 2006 RMP. In the Black Mountain area, social trails are evident in some locations. Where feasible and sustainable, Alternative B proposes to reuse these trails, with minor reconstruction or improvements, to ensure long-term sustainability. Otherwise, trails in this area would be established in natural washes (where minimal or no construction is required) or would be newly constructed.

In the Hidden Valley area, Alternative B would designate a 29-mile network of hiking only trails emanating from the Visitor Center and hiking and equestrian trails emanating from the Hidden Valley trailhead. Both trailheads are proposed in the 2006 RMP. Approximately 21 miles of this network would be located within the North McCullough Wilderness. Alternative B would provide

a new network of single-track trails to wilderness points of interest, including Sutor, Pyramid, and Little Sheep Peaks and throughout the Hidden Valley area.

Equestrian use from the Visitor Center would not be allowed under Alternative B. Ultimately, this would be controlled by lack of equestrian facilities at this location and would be monitored by the proposed Visitor Center staff and volunteers. On the north side, the main Petroglyph Canyon is gated with a cable fence to discourage equestrian (and motorized) uses in the Petroglyph Management Area. Equestrian use would be allowed in the wilderness from the Hidden Valley trailhead; however, equestrian users would not be permitted to enter the Petroglyph Management Area boundary. Use restrictions would be posted at the Hidden Valley trailhead, but no signs, gates, or fences would be constructed at the Petroglyph Management Area boundary due to wilderness restrictions.

Three of the four trails identified in the RMP are located in the wilderness: Petroglyph, Cowboy, and Hidden Valley. The Petroglyph Trail is located entirely within a large wash. The natural wash bottom would serve as the trail tread. Therefore, Alternative B would not propose any modifications to the main Petroglyph Trail. However, the main Petroglyph Trail encounters several large rock obstructions (or, “rock dams”). The WMP clearly states that “because of major obstructions along the Petroglyph Trail, the Cowboy Trail will provide a more negotiable and safer alternative means of access to the Sloan Canyon Petroglyph Site.”

As it is currently shown in the 2006 RMP and WMP, the Cowboy Trail is difficult to discern on the ground and is poorly aligned from a long-term sustainability perspective. Alternative B would realign portions of the Cowboy Trail to avoid steep grades and side slopes, to improve navigation through the wash, and to fulfill the WMP intent of providing a safer, more negotiable route to the Sloan Canyon Petroglyph Site. The realignment of the Cowboy Trail would eliminate the need for placement of structures designed to negotiate the rock obstructions along the Petroglyph Trail (i.e., ladders or handholds). Alternative B proposes to realign portions of the Cowboy Trail to provide access to the site in a manner that preserves wilderness character and protects the cultural resources within the Petroglyph Management Area. The improvements to the Cowboy Trail would consist of rerouting segments located on unsustainably steep grades to slopes with lesser grade, incorporating climbing turns or switchbacks, creating natural rock steps, and/or promoting cross-slope drainage. Ultimately, the realigned Cowboy Trail would be approximately 300 feet longer than shown in the RMP.

As noted previously, the RMP identified trails are, in some locations, difficult to discern on the ground. Alternative B would formally establish the Hidden Valley Trail so that all segments are discernible. A 2-foot wide trail tread would be developed for the entire length of the alignment shown on Map 6 (approximately 2.6 miles total, 1.8 miles in wilderness). In some locations, establishing a formal trail would be accomplished by simple techniques, such as raking gravel or detritus from the intended trail tread or moving boulders from the alignment. In other locations, establishing a formal trail would utilize more complex techniques and improvements, such as building short retaining walls, natural rock steps, or creating partial and full bench trails. Alternative B improvements to the Hidden Valley Trail would consist of approximately 15 rock steps, 10 switchbacks or climbing turns, less than 200 feet of full bench trail, less than 500 feet of partial bench trail, and less than 200 feet of retaining walls.

In two locations, Alternative B proposes minor deviations (up to 250 feet) from the RMP-proposed Hidden Valley Trail. These deviations are shown on Map 9. The first deviation was proposed to avoid a wash that is not conducive for a designated trail; the wash was found to be

too narrow, too steep, or too overgrown, and a suitable alternative route existed nearby. The second deviation was proposed to avoid deeply eroded gullies and runnels. The Alternative B alignment traverses above these gullies.

Outside of the wilderness boundary in the Hidden Valley area, Alternative B would construct an approximately one-mile paved accessible trail in the vicinity of the Hidden Valley trailhead, as proposed in the RMP. This accessible trail would create a relatively flat loop near several interesting cultural sites. The paved accessible trail alignment at Hidden Valley is identified and analyzed in Chapter 3.0 of this EA. However, construction of this route, including any necessary paving and/or grading, would be addressed and completed as part of the future trailhead and Visitor Center planning and construction process. An example trail cross-section for the paved, accessible trail at Hidden Valley is shown in Figure 25.

Construction techniques, trail specifications, and long-term maintenance activities are described under Section 2.2.5, *Elements Common to All Alternatives.*

2.2.3 ALTERNATIVE C

In addition to the approximately 58-mile trail network proposed in Alternative B, this alternative would also incorporate approximately 10 miles of existing unauthorized OHV and motorized routes in the Dutchman Pass area into the trail system. The Alternative C network would include a total of approximately 68 miles of trail (Map 7).

A basic legal description of Alternative C is as follows:
T22S R62E Sections 25, 35, 36; T23S R63E Sections 6, 18; T23S R62E Sections 1, 2, 3, 10, 11, 12, 13, 14, 15, 16, 20, 21, 22, 23, 29, 30; T23S R61E Sections 25, 26, 33, 34, 35, 36; T24S R61E Sections 1, 2, 3, 4, 9, 10, 11.

In the Dutchman Pass area, the Alternative C trails would be the same as described for Alternative B, above. Additionally, Alternative C would convert approximately 10 miles of existing, unauthorized OHV/motorized social trails to designated non-motorized routes in order to enhance the proposed trail network in the Dutchman Pass area. These OHV routes would be partially restored and adapted for use as pedestrian or multipurpose trails (biking, equestrian, etc.).

The existing unauthorized OHV and motorized routes that are proposed for use under Alternative C are shown on Map 7. Many of these routes have a width of 10-12 feet or more, which is greater than the standard 4-6 feet width of most trails planned for the area. At those locations where an existing OHV route width exceeds the proposed trail width, a portion of the disturbed area would be restored to narrow its width to the appropriate trail standard (see Figures 41-42 for examples of OHV/road conversion to non-motorized trail). Restoration would include the use of a variety of techniques, including breaking up compacted surfaces, recontouring to the natural grade, seeding or planting of vegetation from local genetic sources, or rock placement to mimic the form and texture of the surrounding landscape. Ultimately, the restored portion of the OHV route would appear as natural.

In the Black Mountain, Visitor Center, and Hidden Valley areas, the trails proposed under Alternative C would be identical to those described for Alternative B above, including new wilderness trails and modifications to the Cowboy and Hidden Valley trails within wilderness.

Outside of the wilderness boundary in the Hidden Valley area, Alternative C would construct an approximately one-mile paved accessible trail in the vicinity of the proposed Hidden Valley trailhead. As described for Alternative B, this accessible trail would create a relatively flat loop near several interesting cultural sites. The paved accessible trail alignment at Hidden Valley is identified and analyzed in Chapter 3.0 of this EA. However, construction of this route, including any necessary paving and/or grading, would be addressed and completed as part of the future trailhead and Visitor Center planning and construction process. An example trail cross-section for the paved, accessible trail at Hidden Valley is shown in Figure 25.

Construction techniques, trail specifications, and long-term maintenance activities are described under Section 2.2.5, *Elements Common to All Alternatives.*

2.2.4 ALTERNATIVE D – PROPOSED ACTION

Under Alternative D, the BLM would pursue the development and designation of approximately 45 miles of trails throughout the northeast and northwest portions of the NCA outside of the wilderness (Dutchman Pass, Black Mountain, and Hidden Valley areas) (Map 8). Alternative D was developed to provide an expanded network of trail facilities and trail-related recreational opportunities in areas outside of the wilderness while providing for formally designated trails, consistent with the RMP and WMP, within the wilderness.

A basic legal description of Alternative D is as follows:
T22S R62E Sections 25, 35, 36; T23S R62E Sections 1, 2, 3, 10, 11, 12, 13, 14, 15, 16, 20, 21, 22, 23, 29, 30; T23S R63E Sections 6, 18; T23S R61E Sections 25, 26, 35, 36; T24S R61E Sections 2, 3, 10.

In the Dutchman Pass area, the trails proposed under Alternative D would be identical to those described for Alternative C, including the restoration and conversion of approximately 10 miles of OHV routes to hiking, biking, and equestrian trails. Refer to the Alternative C description for a complete discussion on the conversion of these routes to formally designated trails.

In the Black Mountain and Visitor Center areas, the trails proposed under Alternative D trails would be identical to those described for Alternative B (and C) above. Refer to the Alternative B (and C) descriptions above for details on the improvements and routes selected for analysis.

Within the North McCullough Wilderness or Hidden Valley area, Alternative D would most closely resemble Alternative A, No Action. Alternative D would formally establish and designate the Petroglyph, Cowboy, and Hidden Valley trails. Each of these trails is identified in the RMP and WMP; however, in many cases, the trail is not evident on the ground or the alignment poses safety and resource concerns. Identical to Alternative B, Alternative D would realign and improve the Cowboy and Hidden Valley trails.

As it is currently shown in the 2006 RMP and WMP, the Cowboy Trail is difficult to discern on the ground and is poorly aligned from a long-term sustainability perspective. Alternative D would realign portions of the Cowboy Trail to avoid steep grades and side slopes, to improve navigation through the wash, and to fulfill the WMP intent of providing a safer, more negotiable route to the Sloan Canyon Petroglyph Site. The realignment of the Cowboy Trail would eliminate the need for placement of structures designed to negotiate the rock obstructions along the Petroglyph Trail (i.e., ladders or handholds). Alternative D proposes to realign portions of the Cowboy Trail to provide access to the site in a manner that preserves wilderness character and

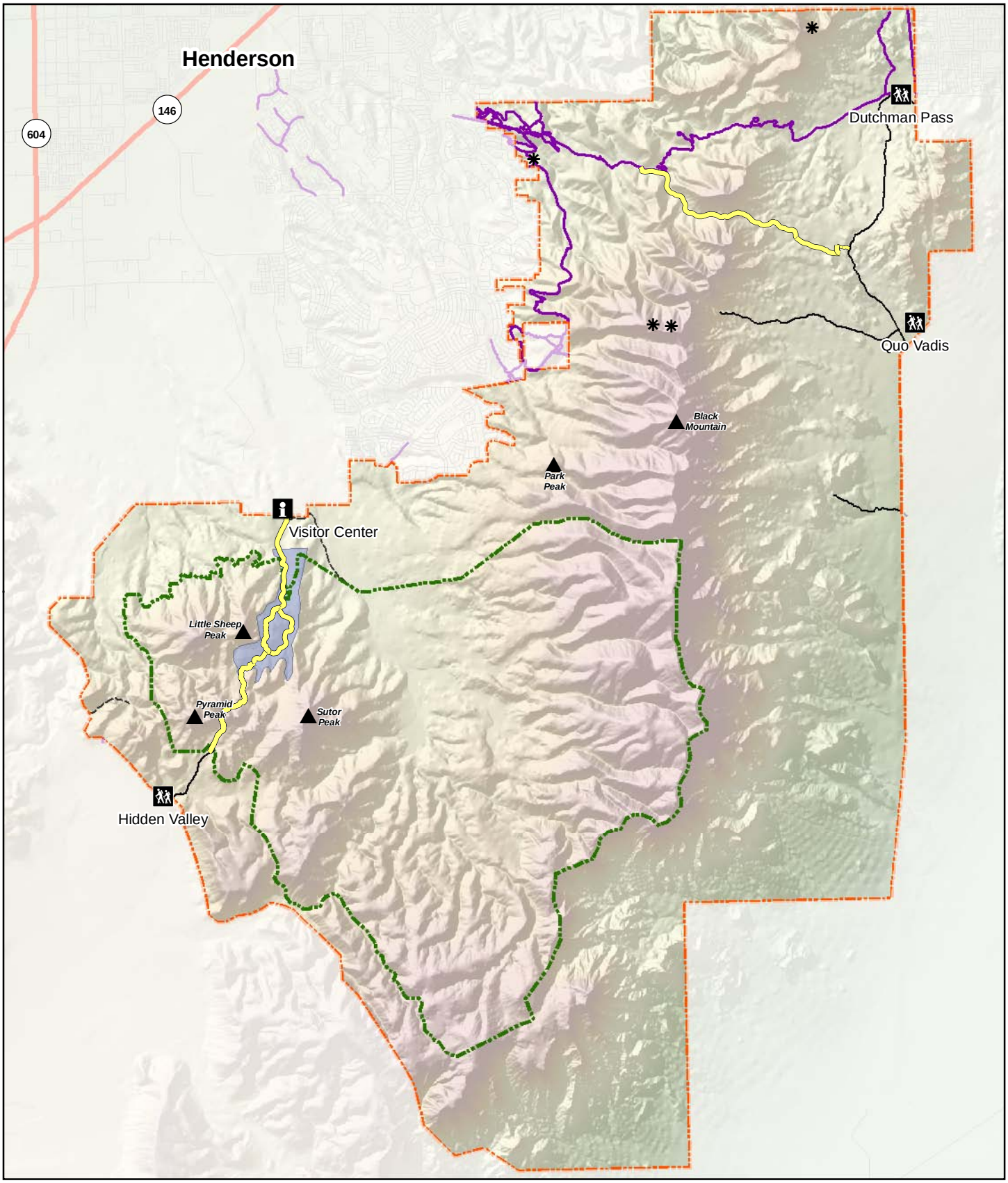
protects the cultural resources within the Petroglyph Management Area. The improvements to the Cowboy Trail would consist of rerouting segments located on unsustainably steep grades to slopes with lesser grade, incorporating climbing turns or switchbacks, creating natural rock steps, and/or promoting cross-slope drainage. Ultimately, the realigned Cowboy Trail would be approximately 300 feet longer than shown in the RMP.

As noted in the Alternative A description, the RMP-identified trails are, in some locations, difficult to discern on the ground. Alternative D would formally establish the Hidden Valley Trail so that all segments are discernible. A 2-foot wide trail tread would be developed for the entire length of the alignment shown on Map 8 (approximately 2.6 miles total, 1.8 miles in wilderness). In some locations, establishing a formal trail would be accomplished by simple techniques, such as raking gravel or detritus from the intended trail tread or moving boulders from the alignment. In other locations, establishing a formal trail would utilize more complex techniques and improvements, such as building short retaining walls, natural rock steps, or creating partial and full bench trails. Alternative D improvements to the Hidden Valley Trail would consist of approximately 15 rock steps, 10 switchbacks or climbing turns, less than 200 feet of full bench trail, less than 500 feet of partial bench trail, and less than 200 feet of retaining walls.

In two locations, Alternative D proposes minor deviations (up to 250 feet) from the RMP-proposed Hidden Valley Trail. These deviations are shown on Map 9. The first deviation was proposed to avoid a wash that is not conducive for a designated trail; the wash was found to be too narrow, too steep, or too overgrown, and a suitable alternative route existed nearby. The second deviation was proposed to avoid deeply eroded gullies and runnels. The Alternative D alignment traverses above these gullies.

Equestrian use from the Visitor Center would not be allowed under Alternative D. Ultimately, this would be controlled by lack of equestrian facilities at this location and would be monitored by the proposed Visitor Center staff and volunteers. On the north side, the main Petroglyph Canyon is gated with a cable fence to discourage equestrian (and motorized) uses in the Petroglyph Management Area. Equestrian use would be allowed in the wilderness from the Hidden Valley trailhead; however, equestrian users would not be permitted to enter the Petroglyph Management Area boundary. Use restrictions would be posted at the Hidden Valley trailhead, but no signs, gates, or fences would be constructed at the Petroglyph Management Area boundary due to wilderness restrictions.

Construction techniques, trail specifications, and long-term maintenance activities are described under Section 2.2.5, *Elements Common to All Alternatives.*



LEGEND

- Sloan Canyon NCA Boundary
- North McCullough Wilderness
- Petroglyph Management Area
- Existing NCA Major Roads
- Alternative A Trails *7.3 Miles*
- Communication Towers
- Visitor Center
- Proposed Trailheads
- Peaks

Sloan Canyon NCA

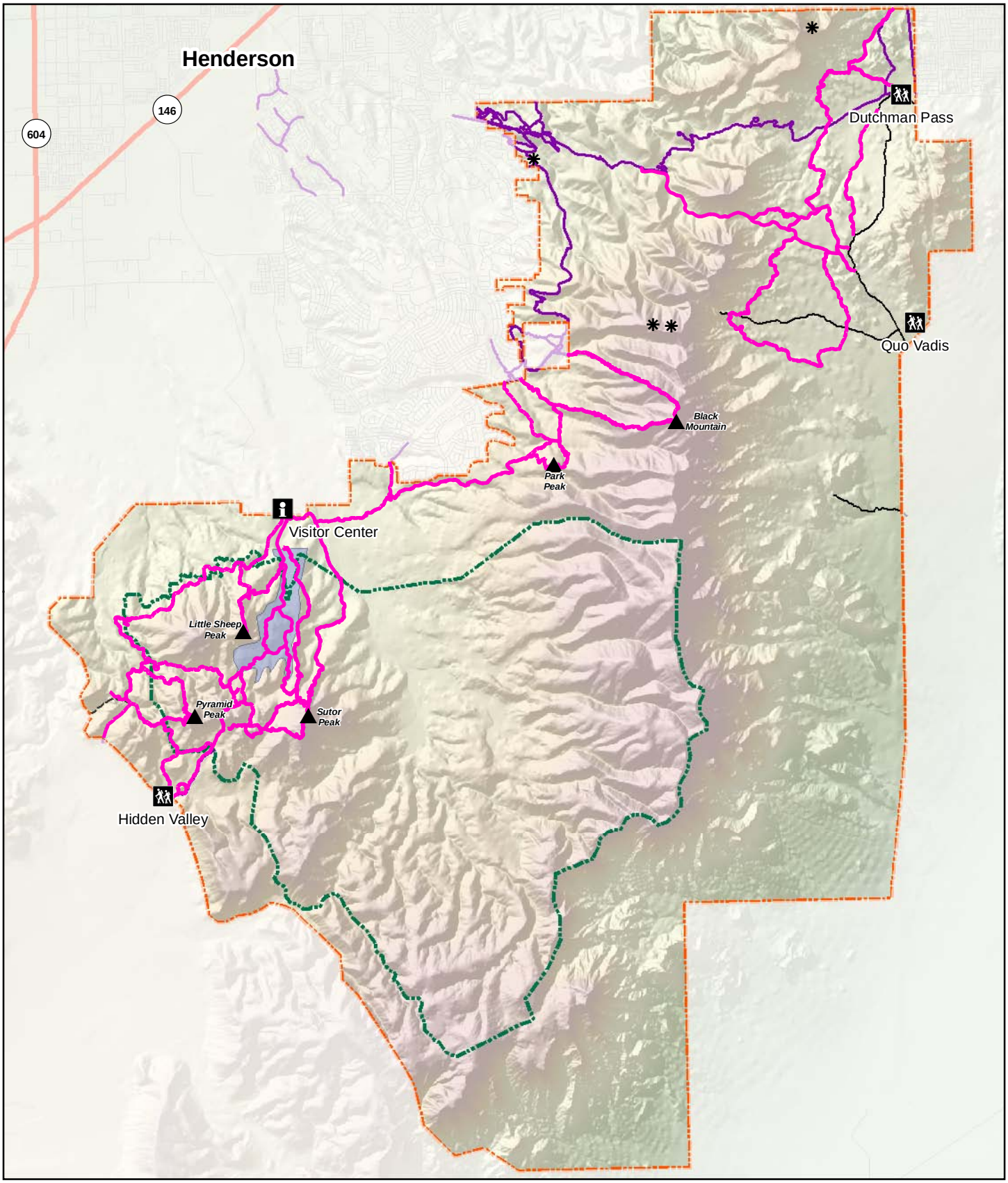
Trails Master Plan

MAP 5 - ALTERNATIVE A

OCTOBER 4, 2009

0 0.5 1 Miles

EDAW | AECOM



LEGEND

- Sloan Canyon NCA Boundary
- North McCullough Wilderness
- Petroglyph Management Area
- Existing NCA Major Roads
- Alternative B Trails *57.8 Miles*
- Communication Towers
- Visitor Center
- Proposed Trailheads
- Peaks

Sloan Canyon NCA

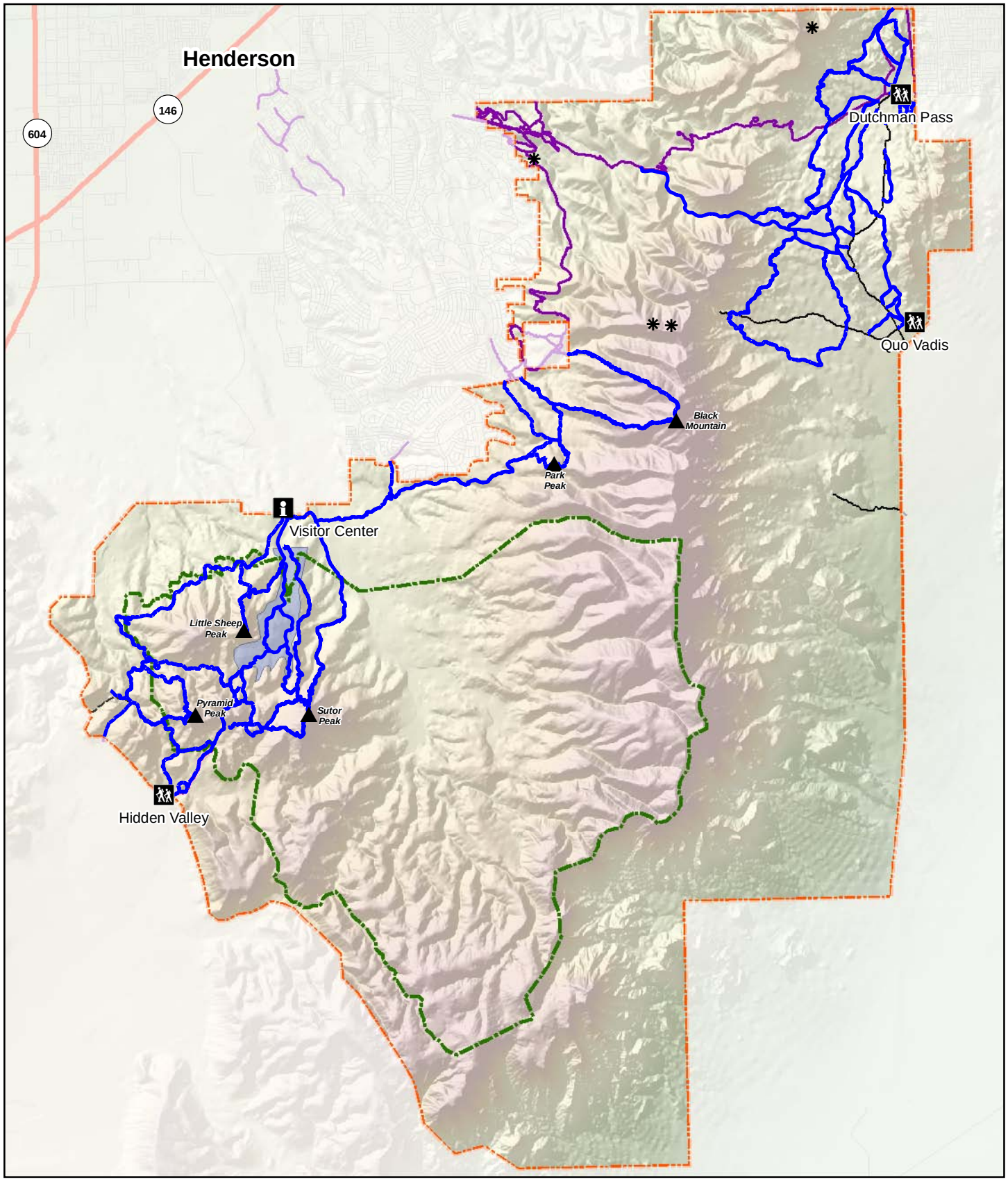
Trails Master Plan

MAP 6 - ALTERNATIVE B

OCTOBER 4, 2009

0 0.5 1 Miles

EDAW | AECOM



LEGEND

- Sloan Canyon NCA Boundary
- North McCullough Wilderness
- Petroglyph Management Area
- Existing NCA Major Roads
- Alternative C Trails *68.4 Miles*
- Communication Towers
- Visitor Center
- Proposed Trailheads
- Peaks

Sloan Canyon NCA

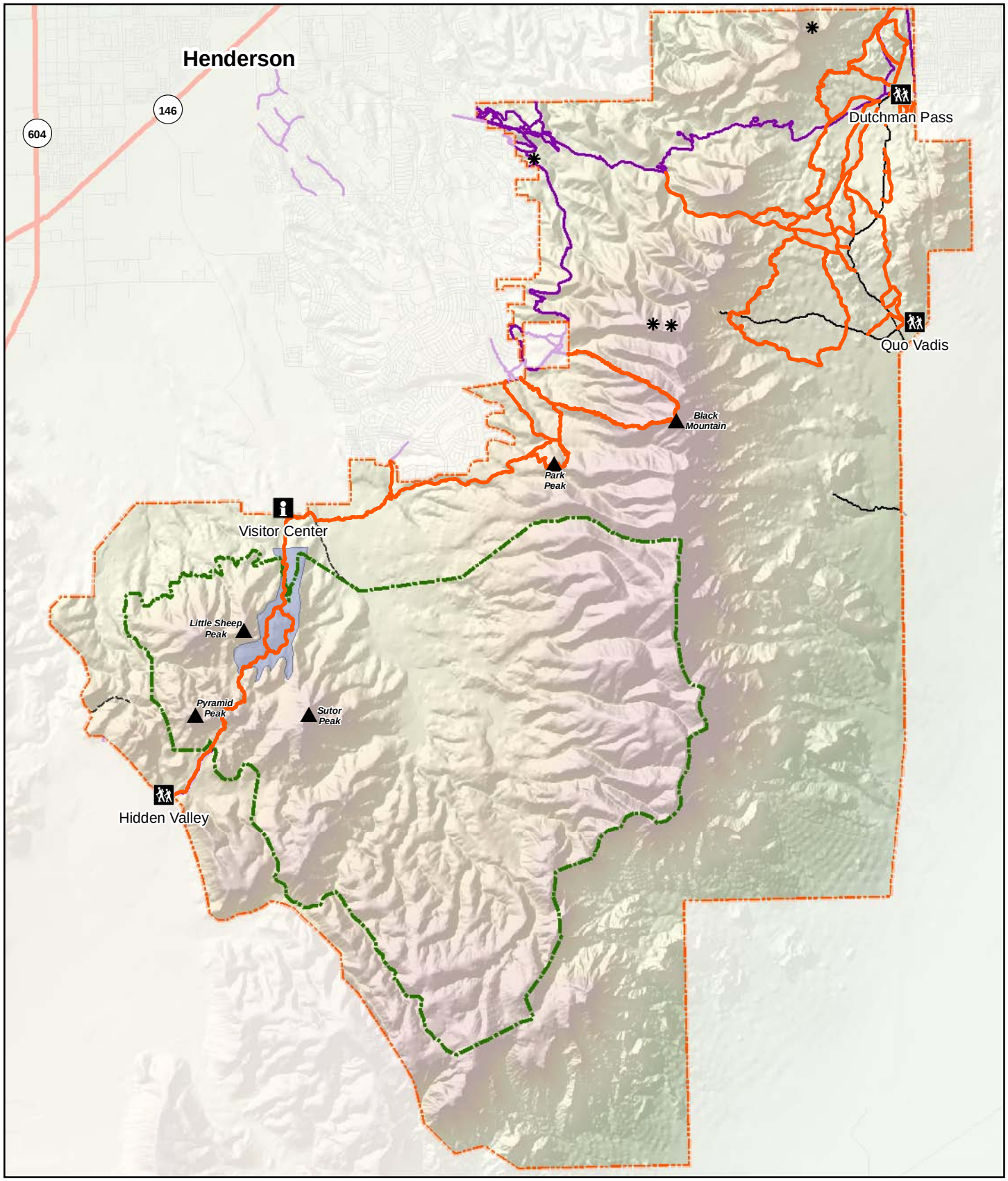
Trails Master Plan

MAP 7 - ALTERNATIVE C

OCTOBER 4, 2009

0 0.5 1 Miles

EDAW | AECOM



LEGEND

- Sloan Canyon NCA Boundary
- North McCullough Wilderness
- Petroglyph Management Area
- Alternative D
- Existing NCA Major Roads
- Alternative D *44.8 Miles*
- Communication Towers
- Visitor Center
- Proposed Trailheads
- Peaks

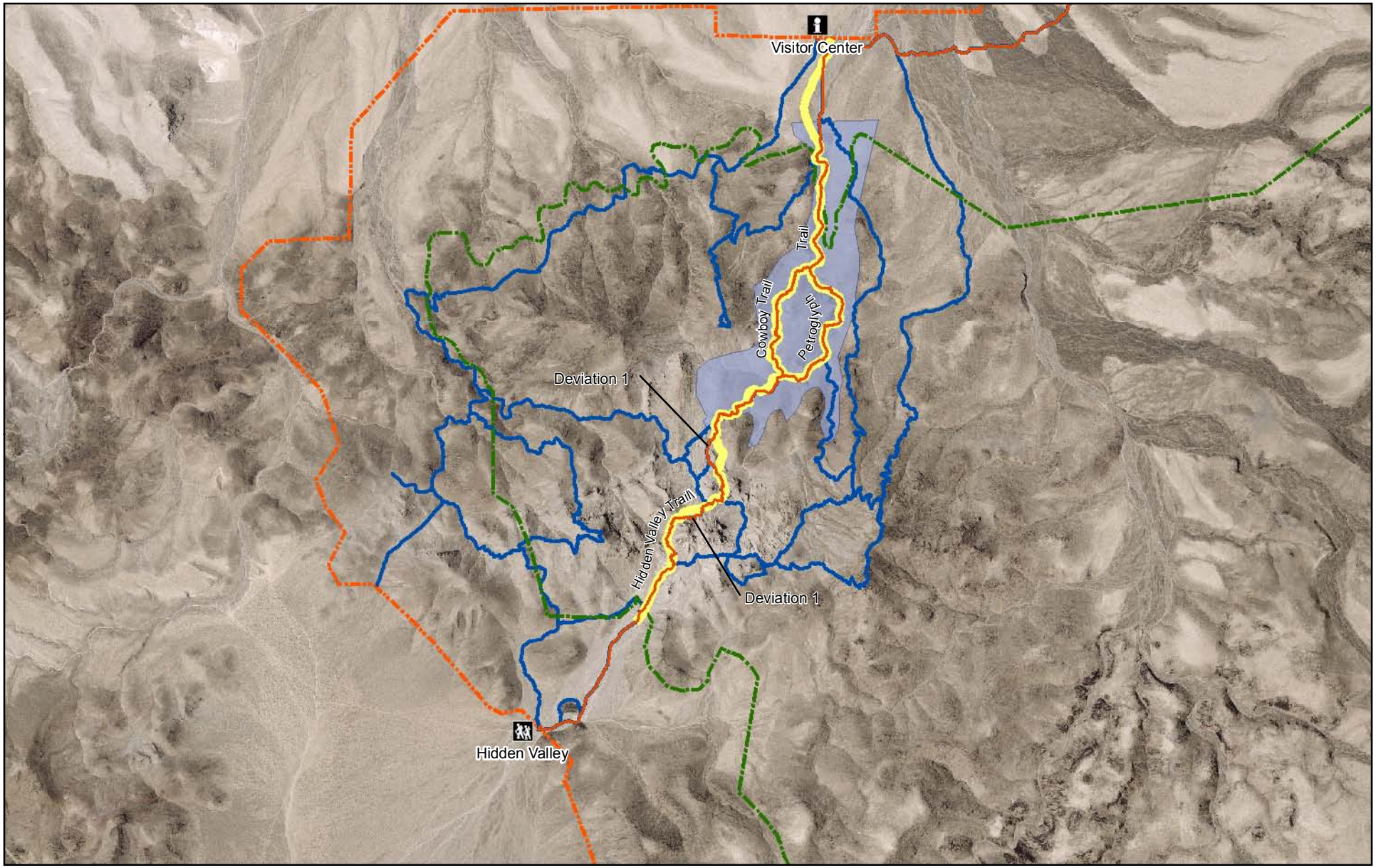
Sloan Canyon NCA

Trails Master Plan

MAP 8 - ALTERNATIVE D

OCTOBER 4, 2009

0 0.5 1 Miles EDAW AECOM



LEGEND

- Visitor Center
- Proposed Trailheads
- Alternative A – Existing, Unimproved Routes as proposed in the 2006 RMP
- Alternatives B/C
- Alternative D
- North McCullough Wilderness
- Sloan Canyon NCA Boundary
- Petroglyph Management Area

Sloan Canyon NCA

Trails Master Plan

MAP 9 - WILDERNESS COMPARISON

OCTOBER 4, 2009

0 0.5 1 Miles

EDAW | AECOM

2.2.5 ELEMENTS COMMON TO ALL ALTERNATIVES

The following elements and construction practices are common to all action alternatives: Alternatives B, C, and D.

Trail Use Types

Each alternative proposes trail networks suitable for the following uses, consistent with the MEA guidance and RMP management actions (see Sections 1.5.2 and 2.1.3):

- Hiking Only
- Hiking and Equestrian Use
- Hiking, Equestrian Use, and Mountain Biking

The differences in how each of these trail types is developed and constructed are largely dependent on the trail location; for example, wilderness versus non-wilderness or frontcounty versus backcountry. See Figures 1-4 for example trail cross-sections by trail type.

Public Access to Trails

Short Term, During Construction

During construction, all areas within the NCA would remain open to the public. The BLM would advise visitors of construction activities and the need for caution when traveling in areas with active trail construction. Construction updates and advisements would be available at the field office or visitor information kiosks. Visitors would be able to travel cross-country to avoid active trail construction sites during the construction phase.

Long Term, Post-Implementation

Informal public access would be permitted to occur utilizing existing BLM and other adjacent public property roads and access routes. Informal access is likely to continue to occur in order to access remote, cross-country travel opportunities, particularly in the southern half of the NCA. None of the action alternatives would modify informal access to areas open to cross-country travel.

Formal public access to the trail network would be provided consistent with the 2006 RMP and the simultaneous and future planning efforts identified in Section 1.5.5, including but not limited to: City of Henderson and Anthem trails and trailheads, City of Henderson Open Space and Trails Plan (2005b), other public trail corridors, neighborhood trail connections, future BLM road improvement plans, and future BLM trailhead and visitor facility development. These improvements and developments are beyond the scope of this planning effort, but will be considered as connected actions in Chapter 3.0. None of the action alternatives propose modifications to formal trail network access points.

Formal trailheads and parking areas will be developed in a separate, future planning process. Until developed trailheads and parking areas are established, existing access routes and parking areas would be used for public access to the trail network.

Trail Construction Types

Each of the action alternatives proposes the following trail construction types:

New Trail – New routes would be designated and new trail segments would be constructed on locations where trails do not presently exist (additional details are provided in subsequent sections). See Figures 5-14 for examples of new trail construction simulations.

Wash Trail – New routes would be designated in existing wash beds, but would require minimal or no construction in or improvements to the existing bed condition. However, entry and exit routes into the washes may require some minor improvements, such as switchbacks or rock steps. These details will be described in subsequent sections. See Figures 15-18 for examples of designated wash trails.

Social Trail / Existing Route Improvements – Existing system trail segments (as identified in the RMP), proposed designated trails that are located on utility rights-of-way or access roads, and select social trails throughout the NCA would be reconstructed or improved to 1) avoid known resource issues (e.g., erosion or sensitive habitat), 2) avoid excessively steep slopes or other trail sustainability issues, or 3) improve the overall visitor and/or recreational experience. See Figures 19-24 for example trail cross-sections and simulations.

(Only Alternatives C and D propose the conversion of existing OHV routes or non-utility roads to designated non-motorized trail(s). As such, the description of this trail type, associated construction needs and techniques are discussed under the individual alternative descriptions; see Section 2.2.3 and 2.2.4).

Trail Widths and Surface

With the exception of the paved, accessible trail at Hidden Valley (described under Alternatives B and C above) and all wash trails, all trails would consist of compacted native surfaces (see Figures 8, 10, 12 and 14 above for examples of native compacted surfaces). No outside material (from outside the NCA boundaries) would be required for trail surfacing.

The following trail widths are proposed for all action alternatives:

2-3 feet – Single-track trail, delineated with native materials; trail meanders to avoid large or prominent natural features, obstacles, or mature vegetation. The majority of the 2-3-foot wide trails are located within the wilderness boundary and in areas with lower anticipated visitation levels (i.e., backcountry). All wilderness trails would be constructed and/or designated with a 2-foot tread, except where, for safety reasons, a 3-4-foot tread is warranted.

4 feet – Wider single-track trail, delineated with native materials; trail meanders to avoid large or prominent natural features, obstacles, or mature vegetation. The majority of the 4-foot wide trails are generally located in areas with higher anticipated visitation levels (i.e., frontcountry areas or near major access points).

5-6 feet – Wider trail bed, delineated with native materials; trail designed to avoid large or prominent natural features, obstacles, or mature vegetation. All 5-6-foot wide trails are located in non-wilderness, multi-use areas and in areas with higher anticipated visitation levels (i.e., frontcountry areas or near major access points).

8-12 feet – Wider trail bed, delineated with native materials; this type of trail would be located primarily on existing OHV routes and roads. All 8-12-foot wide trails are located in non-wilderness areas, and are designed for the highest level of visitation as well as multiple uses.

Washes – The existing wash bottom will be utilized as the trail bed; little or no improvements would be necessary. Trail width would vary depending on the natural wash bed extent.

Wilderness and Non-Wilderness Construction Activities/Tools

All trail construction, maintenance, and restoration activities will be conducted consistent with BLM Manual 9114.

Construction practices within the North McCullough Wilderness Area will be conducted consistent with the 1964 Wilderness Act and the 2006 North McCullough Wilderness Management Plan. For example, no wheeled or mechanical equipment or tools will be used for construction of trails within the wilderness area. Wilderness construction techniques will use the minimum tool necessary to accomplish trail construction objectives. Examples of permissible hand tools and/or equipment include: hand picks, hazel hoe, shovel, Pulaski, digging bars, pack animals, etc.

Outside of the wilderness and Petroglyph Management Area boundaries, there are no restrictions on the use of mechanical or motorized equipment. Examples of typical trail construction machinery include small excavators, backhoes, gas-powered tools, or all-terrain vehicles.

Construction Techniques / Improvements

Retaining Walls

Retaining walls are constructed to either support or maintain a bank or slope. All proposed retaining walls would be constructed using native rock collected during trail bed excavation or from areas adjacent to the trail corridor. See Figure 26 for a typical retaining wall example.

Partial and Full Bench Trail Construction

Bench trail construction is used when traversing moderate to steep side slopes. Bench trail construction may consist of either partial or full benching techniques.

Full bench trails are the preferred method for sustainable trail construction on steep side slopes. Full bench construction requires the excavation of the full width of the trail tread and the cut and fill slopes adjacent to the trail tread, resulting in greater quantities of excavated material.

Partial bench trails excavate the uphill cut slope and a portion of the trail tread while filling the downhill fill slope portions of the trail tread. See Figures 27-28 for examples of full and partial bench trail construction.

The trail networks proposed in Alternatives B, C, and D have been sited and designed to minimize the need for partial and full benching techniques. However, partial and/or full benching may still be necessary in some areas to ensure sustainability of the trail tread or to

enhance route safety. In all locations where full or partial bench trails are necessary, earthwork contrasts would be minimized by re-shaping cut and fill slopes to appear as natural forms. To the extent feasible, boulders, vegetation, and natural drainage will be maintained in these areas.

Wash Trail Entry/Exit

Many of the washes traversed by the proposed trails have steep sidewalls or banks as a result of erosional processes. To facilitate trail travel into and out of these washes, various construction techniques will be utilized to develop a sustainable trail bed on these steep, loose slopes. Typical construction techniques for these locations include the use of rock steps, switchbacks, or retaining walls (see individual descriptions below). The trail tread in these locations will be armored with native rock to create a stable, sustainable trail tread.

Rehabilitation of Existing Social Trails

In areas where existing social trails are being abandoned for more sustainable routes, some restoration of social routes would occur. Social trail restoration would consist of closing or barricading social routes, raking the social trail tread, scattering rocks and dead vegetation to disguise the former tread, and may include some seeding or plantings from local genetic sources. See Figure 29 for an example drawing of existing social trail closure and restoration practices.

Switchbacks and Climbing Turns

Switchbacks and climbing turns are typically used in steep topography. These construction features are used to gain elevation while maintaining acceptable trail grades. Switchbacks are generally characterized by sharp, near hairpin turns, whereas climbing turns have a much larger turning radius but still accomplish the desired elevation gain.

Construction of these features typically requires the placement of boulders to create a down-slope retaining wall and to facilitate proper drainage. Climbing turns are considered to be more sustainable from a maintenance perspective. Users of all types generally prefer climbing turns to switchbacks and are, therefore, less likely to short-cut corners. See Figures 30-31 for typical examples of a switchback turn.

Vegetation Clearing

Vegetation clearing is required within the zone of construction for the trail bed. All vegetation would be removed from the trail tread as well as cut and fill slopes. The width of clearing limits will vary from trail to trail and is largely dependent on the steepness of side slopes. (See also the Typical Disturbance Zone discussion below; example figures are also provided in that discussion.)

The final trail alignments have been laid out to avoid mature or unique vegetation communities, including, but not limited to, large Joshua trees or cactus gardens.

Trail Bed Excavation

Trail bed construction modifies the natural terrain, as needed, to provide for user safety, comfort, and trail sustainability and to protect adjacent resources and the trail facility.

In relatively flat areas, trail bed construction may be as simple as pruning or removing vegetation and rocks from the trail tread, or as complex as benching and retaining steep side slopes or providing suitable trail bed in rough, rocky terrain. Vegetation pruning (i.e., select removal of branches or limbs) would be favored over the complete removal of individual plants.

Trail bed excavation techniques would vary depending on the wilderness boundaries. In non-wilderness areas, small motorized excavators and other mechanical equipment would be most efficient for creating and compacting trail bed surfaces. In wilderness areas, trail bed excavation would be limited to non-motorized, non-mechanical hand tools and implements. (See the discussion above regarding Wilderness construction tools and activities.)

Soil material removed during trail bed excavation is generally reused, as needed, on other portions of the trail for fill areas. Rocks and boulders removed during trail excavation will be utilized for retaining walls, rock steps, or other improvements in the trail corridor.

Drainage

Proper drainage is one of the most important factors in producing a sustainable, low-maintenance facility. Trails can dramatically change water flow within watersheds by altering the natural drainage networks. The proposed trails have been designed and would be constructed to prevent or minimize damage from erosion. Additionally, trails were aligned to prevent concentrating runoff or acting as new channels; specific design measures to prevent channeling water onto trails or to minimize erosion potential are discussed in the following paragraphs.

Trail surface erosion results from three factors: soil type; velocity of water along the trail; and length of time running water is allowed on the trail. By modifying any of these three items, erosion potential is changed. The most common modification is to reduce the length of time running water is allowed to operate on the surface material by increasing the number of structures designed to remove this water.

Outsloping hillside trail treads, where trail grades are slight, may be the only feature necessary to ensure quick water removal and surface protection. Sloping the trailhead toward the downward edge is normally sufficient.

When trail grades are greater than trail tread outsloping, surface water travels along the trail before it escapes. The greater the difference, the greater the risk of damage. Other, more intense methods are employed to ensure proper drainage on greater trail grades.

On flatter grades, outsloping the trail adequately protects the trail tread. In the intermediate range of grades, drainage dips are the most effective means to control drainage. On steeper grades, rock water bars are necessary to control drainage.

On steep side slopes, swales on the uphill side of the trail may be constructed where applicable. Swales consist of small channels adjacent and parallel to the trail tread that collect and divert water from the slope and off of the trail out into the surrounding landscape.

The use of culverts, rock drains, water bars, or other water channeling features will be defined in the construction specifications. Examples of trail drainage techniques are provided in Figures 32-35. Where possible, water channeling features other than culverts were incorporated into the action alternatives. (No culverts are proposed for use in the wilderness.)

Culverts require frequent inspection and maintenance and would need to be inspected regularly. Where culverts are necessary, they would be sized appropriately to minimize the risk of failure.

Rock Steps / Stairways

Steps provide an opportunity to gain elevation rapidly over short distances. The proper use of steps can allow other portions of the trail to be constructed on lesser grades, which reduces soil erosion, especially where side drainage is difficult.

Step materials that require little or no future maintenance are preferred. In Sloan Canyon, all steps would be constructed of native rock.

The appropriate design for steps should reflect user requirements, difficulty level provided by the trail, and overall recreation prescription for the area. The type of steps to be constructed depends on the site and materials available.

Within the NCA, rock steps have been incorporated into the final trail alignments in areas where the trail must travel directly up short, steep grades or parallel to the natural fall line. See Figures 36-38 for examples of typical rock step construction.

Typical Disturbance Zone

Within the trail corridor, the area of disturbance is typically related to the steepness of the cross-slope: the steeper the cross-slope, the wider the area of potential disturbance. Slopes within the NCA are highly variable. Figures 25, 27, 28, and 31 depict typical shallow, moderate, and steep slope disturbance zones. Final trail specifications will further define the area of disturbance and work limits.

Disturbances outside of the trail corridor may include cross-country travel by crew personnel to access rock gathering and borrow areas and the actual removal of rock or other native materials. These areas will be restored on a site-by-site basis per the specifications in the final construction documents.

Construction Access

Construction access for contractors, volunteer groups, and BLM staff varies depending on wilderness boundaries and/or the Petroglyph Management Area boundary. At all times, work crews would be requested to carry appropriate BLM documentation/permit while working within the NCA.

In non-wilderness areas, construction crews would be permitted to access all construction sites by mechanical means (e.g., trucks, Sweco, bikes, utility vehicles, motorbikes) using existing social routes, designated roads, or newly constructed trails. In areas where vehicle access does not currently exist (e.g., Black Mountain trails), construction crews would be asked to travel by foot or pack animal to the work site in order to prevent the creation of new social routes.

For construction within the wilderness boundary, crews would be permitted to drive up to the boundary on existing routes. Beyond the wilderness boundary, crews would be expected to travel by foot, pack animal, or other non-mechanized means to wilderness trail construction sites.

For construction within the Petroglyph Management Area, crews would be expected to adhere to all wilderness construction practices, including but not limited to non-mechanized tools and non-mechanized access to work sites.

Area-specific access concerns and strategies are provided below.

Dutchman Pass Area

Access to and within the Dutchman Pass area is available via the Dutchman Pass Road, an extensive network of existing unauthorized OHV routes, and navigable washes. For trail construction purposes, work crews would be permitted to use motorized vehicles and mechanical equipment on existing OHV social routes, roads, and in washes.

Existing power line service roads within the Nevada Power right-of-ways would be available for construction access in this area. These service roads would not be modified by the construction crews in any way for the purposes of trail construction access.

Visitor Center Area

Access to the Sutor Peak and Visitor Center area trails would be available via the power line service road that parallels the northern boundary of the NCA. Construction vehicles would be permitted to drive south into the NCA from the power line road, but would not be permitted to drive beyond the wilderness or Petroglyph Management Area boundaries.

Access to the “Northern Traverse” area trails would be available via the east-west power line road, rough four-wheel drive road running parallel to the western boundary of the NCA, any existing unauthorized OHV routes, and navigable washes. Proposed trails in this area cross in and out of the wilderness boundary. It will be the crew’s responsibility to abide by the wilderness boundary travel restrictions in these areas.

Several residential communities are located immediately adjacent to the Visitor Center area. Many of these neighborhoods have existing gates or service roads that could provide construction crew access to the NCA. The BLM anticipates that some limited use of these neighborhood service roads and gates is likely. The BLM would coordinate any and all neighborhood access needs with the City of Henderson to ensure that residents and property owners are properly notified in advance of project implementation.

Black Mountain Area

Access to the Black Mountain and Park Peak trails would be provided by the access road to the communications towers located on the peak north of Black Mountain. Construction access to gated areas south of the Shadow Canyon neighborhood, including the stormwater detention basin and communication towers roads, would be coordinated with the City of Henderson and appropriate power and communications authorities.

Several residential communities are located immediately adjacent to the Black Mountain area. Many of these neighborhoods have existing gates or service roads that could provide construction crew access to the NCA. The BLM anticipates that some, limited use of these neighborhood service roads and gates is likely. The BLM would coordinate any and all neighborhood access needs with the City of Henderson to ensure that residents and property owners are properly notified in advance of project implementation.

Hidden Valley Area

Access to the Hidden Valley area trail network is available via a rough four-wheel drive road running parallel to the western boundary of the NCA. For trail construction purposes, work crews would be permitted to use motorized vehicles on OHV social routes located outside of the North McCullough Wilderness Area.

Schedule

The BLM would construct trails in several phases. The first phase of construction would focus on those trails anticipated to receive the most immediate use, such as trails in the Dutchman Pass area, trails accessing the Petroglyph Canyon Area, and the Park Peak and Black Mountain areas.

Construction documents and decision documents for this project are anticipated in early 2010. Requests for Phase I construction bids could begin in late fall 2009.

Subsequent phases would be implemented as funding, demand, and other developments advance and are scheduled for implementation, such as the final location of the Visitor Center.

Typically, trail construction in wilderness and non-wilderness areas would occur at a rate of 10 miles constructed in 3-5 months and 2-3 months, respectively, by a crew of 3-5 persons.

Construction Operations and Logistics

The following discussion applies to all contract and volunteer personnel responsible for the construction of new trails, required Clearance Surveys (discussed below), and supply vendors.

As part of the trails construction process, the BLM will develop detailed construction documents and specifications for all aspects of trail construction including: work staging areas, crew parking areas and access routes, crew camps, equipment and material tool storage, corrals and feeding areas for pack animals, fuels management, waste management, safety standards, hours of operation, and work camp/staging area restoration.

Construction and Survey Crews

The following discussion applies to all contract and volunteer personnel responsible for trail construction, construction operations, related restoration activities, required Clearance Surveys (discussed below), and supply vendors.

The BLM would use a combination of contractor, volunteer, and BLM staff labor for all construction and restoration activities. Contractor crews would be selected through a competitive bid process. Volunteer and cooperative programs would be used to extend trail construction budgets and to promote community interest in the success of the Trails Master Plan. Volunteer and cooperative program crews would be approved on a case-by-case basis by the BLM. Long-term maintenance activities would be conducted on as needed basis by BLM staff, volunteer groups, and, if necessary, contractor crews (long-term maintenance requirements are discussed below). All crews would be under the supervision of a qualified trail supervisor and/or BLM staff.

Pre-Construction Approvals and Survey Requirements

For projects located in areas with habitat used by desert tortoises, a Clearance Survey may be required as part of the U.S. Fish and Wildlife's biological opinion Terms and Conditions (USFWS 1992). The purpose of the clearance survey would be to temporarily relocate or salvage tortoises from the area of construction and any other area deemed necessary to avoid or minimize the death or incidental take of desert tortoises that may be caused by the project (USFWS 1992).

A Clearance Survey would require full coverage of the project area, and would focus on locating all desert tortoises above and below ground within the project area immediately prior to disturbance (USFWS 1992). The survey period may be stipulated in the Terms and Conditions of the biological opinion to reduce the incidental take of desert tortoises (USFWS 1992).

The BLM would contract qualified desert tortoise surveyors to conduct Clearance Surveys immediately prior to ground disturbance. Pre-construction surveys should be performed by tortoise monitors, holding a 10a permit with USFWS, permitted to handle desert tortoise if necessary.

The discussions provided above regarding Construction Crews and Crew Logistics also apply to the desert tortoise survey crews.

Construction Materials

All material necessary for trail improvements and/or construction would come from within the NCA. Native soils and rocks would be used for all improvements, such as rock steps and retaining walls. Limited or no commercially purchased material would be used for trail construction, with the exception of poured concrete for the paved accessible trail at Hidden Valley. Rock or soil borrow areas would be individually restored by contractor or volunteer trail crews at the time of construction.

Signage and Wayfinding

In non-wilderness areas, directional signs and trail markers would be installed for visitor safety and wayfinding purposes. Signage is typical in non-wilderness settings. In non-wilderness areas, permanent and temporary interpretive exhibits would be installed at key access points, popular trail destinations, or points of interest. Interpretive themes may include, but are not limited to, desert ecology, desert geology, water, cultural resources, petroglyphs, historical, or wildlife. The use of cairns for trail signage and wayfinding would be discouraged as it is difficult for the BLM to monitor and remove user-created cairns on non-designated routes.

In the North McCullough wilderness, trail junctions and trail beds would be delineated with low-profile native materials, including rocks or dead vegetation (Figure 39). Rock cairns would only be allowed on designated trails. Consistent with the 2006 Wilderness Management Plan, no directional signs will be provided in the wilderness area outside of the Petroglyph Management Area. Other signs, interpretive exhibits, and peak registries would not be installed in the wilderness. The use of cairns for trail way-finding on non-designated routes within the wilderness would be discouraged as it is difficult for the BLM to monitor and remove user-created cairns.

Figure 40 shows examples of signage that would be used to facilitate wayfinding on the trail network in areas located outside of the wilderness.

Social Route Restoration

Under each of the action alternatives, the BLM intends to close OHV or other user created routes that intersect proposed trails to facilitate appropriate use of the designated trail system. Specific techniques for route closure and restoration would vary by site. Restoration would include the use of a variety of techniques, including breaking up compacted surfaces, recontouring to the natural grade, seeding or planting of vegetation from local genetic sources, rock placement to mimic the form and texture of the surrounding landscape, or scattering vegetative debris to disguise the old route. Ultimately, the restored portion of the social routes would appear as natural.

Maintenance Requirements

The BLM would develop a trail assessment program to catalog and assess the baseline condition of all trail segments after construction. The trail assessment program would be used to compare future existing conditions and baseline conditions at regular, defined assessment intervals to develop or inform trail maintenance needs and priorities.

Scheduled maintenance requirements would consist of periodic patrols to remedy basic issues, such as removing minor rockfalls, collecting trash, pruning vegetation, disguising newly developed social trails, or rebuilding cairns. BLM staff, trail stewards, volunteer and “friends” groups will be an integral part of regular trail condition monitoring and maintenance.

Major future maintenance activities would be accomplished either through competitive bid contracts, BLM staff labor, or volunteer crew labor.

On power line service roads that are formally designated as BLM trails, Nevada Power would be responsible for all maintenance needs. These dual-purpose routes, service road, and designated trail would be maintained to service road standards. The BLM would not pursue any improvements for hiking, biking, or equestrian uses on these routes.

2.2.6 PROJECT DESIGN FEATURES

The following environmental protection measures would be implemented prior to and during construction to avoid or reduce the potential impacts to NCA resources as a result of the project. The following measures are fundamental components of each of the action alternatives.

Wildlife

1. Trail bed edging, such as rock edging, should be placed so it does not create a barrier to the movement of desert tortoise.

2. Construction crews would be educated on desert tortoise habitat, behavior, and ongoing conservation efforts prior to beginning work on site.

3. If desert tortoise is encountered during construction, crews would cease all activities until the tortoise has safely moved through the construction area. (This applies to construction access roads as well.)

4. If new tortoise burrows are indentified within the proposed trail bed or within 30 feet of the proposed alignment, construction crews will consult with the BLM to adjust the trail alignment accordingly to avoid impacts to active burrows.

5. Trail construction would occur during periods that do not conflict with bighorn sheep lambing or other critical seasons.

Vegetation

1. Topsoil from trail bed excavation activities will be salvaged and used for nearby restoration efforts.

2. All cactus and yucca plants within the construction footprint will be salvaged.

   - Salvaged cactus and yucca plants will be used to revegetate disturbed areas and/or for native plant landscaping at NCA visitor facilities.

   - Salvaged plants will be maintained by a qualified contractor for a period of one year.

3. All construction vehicles will be cleaned and inspected for plant material prior to entering the NCA in order to prevent the transport or spread of noxious weed seeds.

4. Known noxious weed infestations will be treated (either mechanically or chemically) prior to trail construction.

5. If new noxious weed infestations are identified during trail construction, trail crews will report infestation to the BLM for mapping and appropriate treatments.

6. A biological monitor trained in identifying rosy two-toned beard tongue and Blue Diamond cholla shall be on site during trail construction and identify any individuals that occur within or adjacent to the proposed alignment.

7. If BLM sensitive plants are identified adjacent to the trail, especially at downhill locations, proper Best Management Practices will be used to prevent erosion, sedimentation, trampling, or any incidental damage to plants related to construction or trail use.

8. All populations of BLM sensitive plants will be mapped by the biological monitor, and notes on habitat will be taken for later reference during restoration efforts.

9. Interpretive signs will be installed at strategic locations to educate users of the need to stay on trail and the natural history of these rare plant species.

10. If BLM sensitive plants are identified within the trail alignment, the biological monitor will work with the trail designer and BLM staff to avoid impacting individuals where possible. If numerous individuals of BLM sensitive plants are found within the construction footprint, the BLM will prepare a salvage and mitigation plan that would describe salvage, transplanting, and maintenance efforts.

11. At those locations where avoidance is not possible for Blue Diamond cholla, individuals will be salvaged and relocated to an adjacent location that will not be impacted by the trail construction or trail use.

    - If Blue Diamond cholla cacti are salvaged, mature multi-branched individuals will be used to propagate additional individuals at a nursery for planting at an adjacent site with suitable conditions.
    - Salvaged cacti will be allowed to harden before planting to prevent root rot.
    - Once planted, the cactus will be watered until the cactus is established.

12. If rosy two-toned beard tongue is unavoidably impacted during trail construction, rosy two-toned beard tongue seed will be collected if seasonally available.

- Collected seed will be multiplied under nursery conditions.
- Rosy two-toned beard tongue seed will be seeded at sites with suitable habitat conditions.

13. All restoration efforts will be directed by BLM.

14. All seeded or planted plants will be monitored by BLM to document the success or failure of the seeding and planting efforts. Monitoring will occur for five years following installation.

15. An adaptive management plan will be developed if restoration efforts prove to be unsuccessful to implement remedial measures.

Visual Resources

1. Large rocks and boulders removed and used in all trail construction must be placed with the darkened (desert varnish) side facing up and/or out. If the light side of the rock is visible, a desert varnish colorant, such as Permeon, will be applied. Rock surfaces will be sprayed to simulate the coloration of the surrounding desert varnish. The substance would be applied, with the use of a backpack sprayer, on rock surfaces that contrast sharply with the surrounding landscape.

Wilderness Resources

1. Project and contractor personnel would employ Leave No Trace techniques during project implementation.

2. A BLM Wilderness Planner will be on site during construction to ensure conformance with the Minimum Requirements Decision Guide (MRDG) and approved EA. A log of developments (description, location, purpose, and expected outcome of feature) will be provided following project completion.

3. Wilderness trail construction information will be available at wilderness access points/trailheads and on the BLM website. Available information will include project dates and locations in order to reduce conflicts with wilderness visitors during project implementation.

4. Following implementation, wilderness trail uses and types (hiking, equestrian, other), uses of existing social trails, and the creation of new social trails will be monitored by BLM staff.

5. The BLM will provide information on travel restrictions, including access to and travel within the Petroglyph Management Area, at wilderness access points/trailheads and on the BLM website.

Cultural

1. Any cultural property found eligible for inclusion on the National Register of Historic Places (NRHP) will be protected through avoidance or the development of a treatment plan in accordance with the NHPA and relevant BLM policy.

2. If artifacts, features, or other indications of previously unrecorded heritage resources are identified in the course of ground-disturbing activities, all work in the vicinity of those materials will cease and the BLM Archaeologist would be notified immediately. Appropriate measures will then be implemented to preserve the integrity of the site.

3. Prior to construction, the BLM Archeologist will identify areas where construction staging activities are allowed, to avoid impacts to eligible sites.

4. An overall outline of how weeds will be monitored for, and what control methods are possible, is necessary.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED

The ID Team considered, but eliminated, several potential alternatives and alternative elements because they did not meet the purpose and need of the project; were not feasible due to analysis area constraints; would have resulted in unacceptable resource impacts, or were determined to be inconsistent with the approved RMP. Alternatives and alternative components considered but eliminated are described below.

2.3.1 MAXIMUM TRAIL DEVELOPMENT

This alternative would have pursued over 100 miles of trails throughout the entire NCA, and would have provided trail access into the remote southern portion of the NCA and to the main McCullough Range ridgeline. This alternative was ultimately eliminated from further consideration for several reasons. This alternative was considered to be inconsistent with the conservation intent of the NCA designation. Given the remoteness of and poor access into the southern and southeastern portions of the NCA, visitation is expected to remain extremely low in these areas. Additionally, the RMP permits cross-country travel by both hikers and equestrian users in this area.

2.3.2 INCORPORATION OF ALL OHV AND SOCIAL ROUTES INTO TRAIL NETWORK

This alternative would have adopted all existing social trails, OHV routes, and unauthorized roads into the proposed trail network. While this alternative would have resulted in an extensive trail network with minimal new disturbance, this alternative was ultimately eliminated due to concerns about visitor safety (primarily, users getting lost or confused by multiple routes), long-term maintenance needs, and existing and reasonably foreseeable resource damage.

2.3.3 ABANDON THE COWBOY TRAIL AND CONSTRUCT IMPROVEMENTS IN THE MAIN PETROGLYPH CANYON

This alternative would have abandoned the Cowboy Trail (identified in the RMP and WMP) and would have proposed the main Petroglyph Canyon wash as the primary access route to the petroglyph gallery. This alternative would have included several major improvements at the site of four rock obstructions in the main canyon wash to allow safe passage through each of the obstructions. Improvements would have included rock steps, hand rails, and/or ladders. This alternative was ultimately eliminated because it was determined to be inconsistent with the approved RMP and North McCullough Wilderness Management Plan, which specifically prohibit these modifications.

2.4 MONITORING

2.4.1 CURRENT MONITORING

Currently, resource and visitor use monitoring within the NCA is limited to periodic site visits by BLM personnel and reported observations from NCA visitors, neighbors, stakeholders, and volunteer groups.

2.4.2 FUTURE EFFECTIVENESS MONITORING

Effectiveness monitoring is long-term monitoring and focuses on determining whether the analysis area is meeting or moving toward desired future conditions, and if the rate of change is acceptable. Acceptable rates of change are determined by the Responsible Official unless otherwise specified in the RMP.

Although current monitoring activities are limited, if either action alternative is implemented the BLM would enhance their on-the-ground presence with additional field personnel or regularly schedule monitoring trips. Additionally, if either action alternative is implemented, the BLM anticipates an increased interest in the NCA from various organized user groups. It is hoped that these organized groups, including volunteers, would help to further resource and visitor use monitoring efforts on the ground.

Future monitoring will occur to assess impacts to wilderness character including visitor use encounters on designated trails and trail conditions (measurements and photos) and social trails deviating from the designated trails.