II. ALTERNATIVES

This chapter describes and compares the alternatives considered for the Village of Oak Creek-to-Sedona natural gas pipeline. It includes descriptions of alternatives that were considered but eliminated from further analysis (including justification for that elimination), alternatives that were considered in detail in this EA, and recommended mitigation measures and monitoring. Nine alternatives (eight build alternatives and a No Action Alternative) were identified during the development phase of the project.

A. Alternatives Considered but Eliminated from Further Study

Three of the eight build alternatives identified during the development phase of the project were eliminated from further study because of lower overall benefit to the infrastructure (e.g., low operational flexibility), constructability, substantial anticipated environmental impacts, and safety concerns. These three alternatives, as well as the reasons for their elimination from further study, are described below.

i. Parallel Supply Line from Cottonwood Alternative

This alternative would construct an 18-mile-long pipeline beginning in Clarkdale and ending in northwest Sedona, paralleling the existing Sedona Supply Line. Although this alternative would provide adequate supply for customers in Sedona, this pipeline would be 12.7 miles longer than a connection from the Village of Oak Creek to Sedona. This extended length would result in higher construction costs and the potential for larger geographic areas of environmental impact. Because this line would not create a “loop” of infrastructure, it would not provide the operational flexibility to allow reverse flow in the case of pipeline damage, and customers would still be at risk for outage if the pipelines were ruptured or damaged.

ii. Parallel Supply to the Red Rock Loop Alternative

This alternative would construct a 6-mile-long pipeline from west Sedona to SR 179 in southeast Sedona. The line would push supply from west to east to increase pressure levels, but would not provide the additional supply needed to serve Sedona’s customer demand. Without the influx of additional supply, the current low-pressure issues would not be alleviated. Because this line would not create a “loop” of infrastructure, it would not provide the operational flexibility to allow reverse flow in the case of pipeline damage, and customers would still be at risk for outage if the pipelines were ruptured or damaged. This alternative would also require construction through Oak Creek, which could have substantial environmental impacts.

iii. Verde Valley School Road Alternative

This alternative would construct a 6.5-mile-long pipeline from just east of the Red Rock crossing of Oak Creek to the SR 179 intersection with Jacks Canyon Road. The Verde Valley School Road Alternative would not provide a loop feed, and would therefore not meet the purpose and need of the project. This alternative would also require construction through Oak Creek, which could have substantial environmental impacts. Portions of construction would occur adjacent to the existing Verde Valley School Road and

would require one-way traffic controlled by flagmen. Because the construction would occur in a residential area with high traffic volumes, substantial traffic delays would be expected—resulting in traffic issues for a longer distance then any of the alternatives considered in detail.

B. Alternatives Considered in Detail

Five build alternatives and a No Action Alterative were considered in detail. The five build alternatives (Blue [the proposed action], Red, Orange, Yellow, and Purple Alternatives) all would construct a segment of 6-inch-diameter steel pipe that would begin at an existing UES regulating station (located at the southern border of the Village of Oak Creek) and continue north to Back O' Beyond Road in southern Sedona. All five build alternatives follow the same alignment in the Village of Oak Creek: they all proceed east just south of the Circle K, turn south and proceed along Canyon Diablo Road, turn west on Jacks Canyon Road, cross SR 179, and proceed south along the western boundary of the SR 179 roadway before turning west at the Village of Oak Creek limits to end at Arabian Drive just west of Rojo Drive. More detailed descriptions of the five build alternatives, as well as the No Action Alternative, are provided below.

i. Blue Alternative

This alternative, the action as originally proposed, would follow the existing northbound SR 179 lanes, inside the existing ADOT ROW (Figures II-1–II-2) within the CNF, before extending south through the Village of Oak Creek. The Blue Alternative is 5.3 miles long and encompasses a temporary disturbance area of 27.4 acres and a permanent maintenance ROW of 6.4 acres.

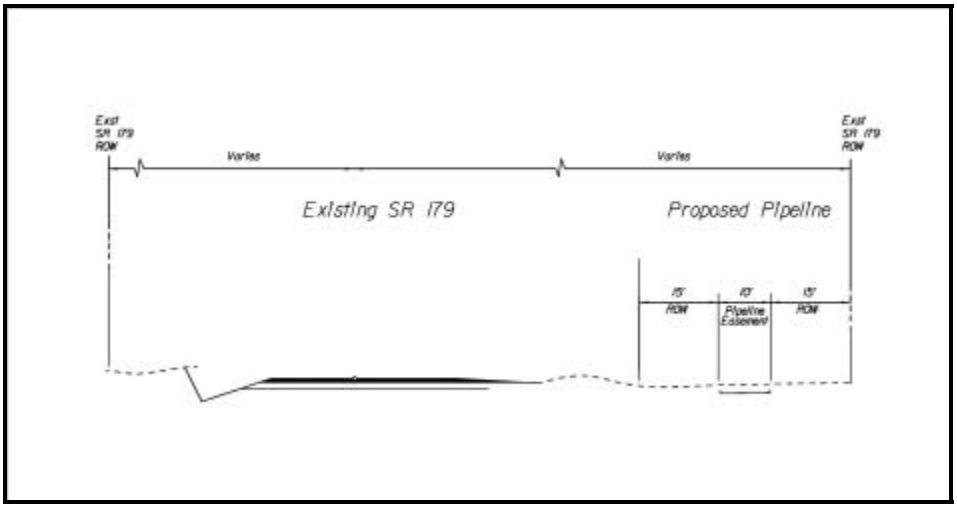

Figure II-1. Cross Section of the Blue Alternative

Key

Blue Alternative

Coconino National Forest Boundary

Trailhead Key

(A) Cathedral Saddle Trailhead

(B) Little Horse Hub Trailhead

(C) Bell Rock North Trailhead

(D) Bell Rock Vista

(E) Bell Rock Pathway Hub Trailhead

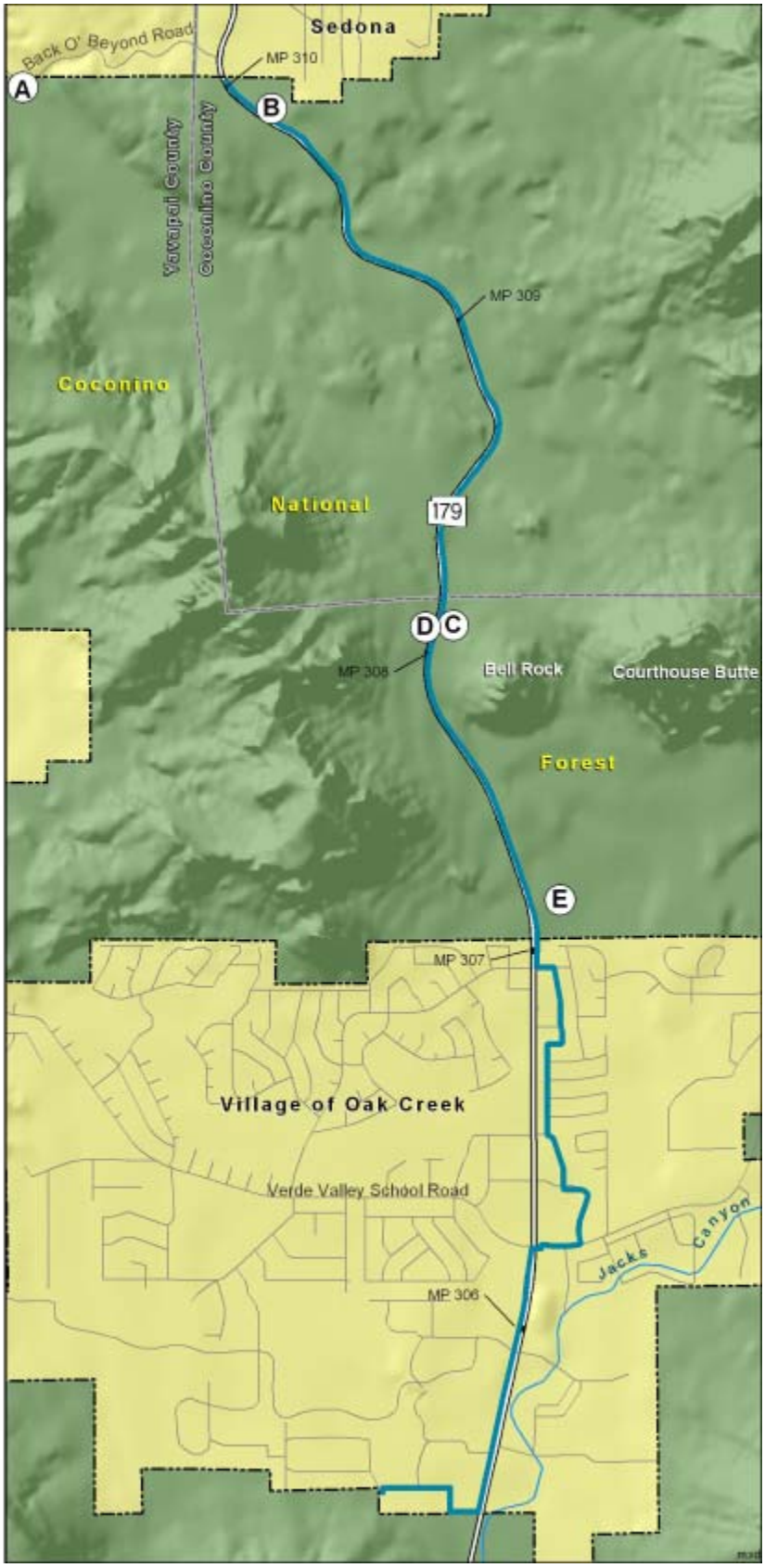

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Figure II-2. Blue Alternative

ii. Red Alternative

The Red Alternative would generally follow the existing Bell Rock Pathway in the northernmost section of the project area, divert from the Bell Rock Pathway to continue south—where it would realign with the Bell Rock Pathway around Bell Rock—then follow an existing Qwest Communications overhead telephone line corridor to the access road to the Bell Rock Pathway Hub Trailhead, before continuing south through the Village of Oak Creek (Figure II-3). UES would rebuild portions of the pathway surface that would be disturbed by construction. This alternative is 5.4 miles long and encompasses a temporary disturbance area of 28.0 acres and a permanent maintenance ROW of 6.6 acres. If an agreement can be reached between Qwest and UES, Qwest may relocate its overhead line underground, concurrent with the construction of the proposed gas line. Under this alternative, the required posts to demarcate the pipeline would be set off the trail, and information providing the distance to the pipeline would be provided on each post.

iii. Orange Alternative

This alternative would generally follow the existing Bell Rock Pathway in the northernmost section of the project area, then divert from Bell Rock Pathway to continue south, where it would cross SR 179 at the Yavapai/Coconino County boundary (roughly between Bell Rock North Trailhead and Bell Rock Vista), to avoid disturbing the base of Bell Rock (Figure II-4). North of its SR 179 crossing, the Orange Alternative follows the same alignment as the Red Alternative.

The alignment would continue south along the proposed southbound lanes of FHWA and ADOT's SR 179 EA highway alignment, before crossing SR 179 to the east at the Village of Oak Creek and continuing south. Portions of the pathway surface that would be disturbed by construction would be rebuilt. The Orange Alternative is 5.5 miles long and encompasses a temporary disturbance area of 28.4 acres, with a permanent maintenance ROW of 6.7 acres. Under this alternative, the required posts to demarcate the pipeline would be set off the trail, and information providing the distance to the pipeline would be provided on each post.

iv. Yellow Alternative[4]

The Yellow Alternative would follow along the proposed southbound alignment of FHWA and ADOT's SR 179 EA (in the proposed bifurcated section), before continuing south through the Village of Oak Creek (Figure II-5). This alternative assumes that the highway would not be built; the pipeline alignment would be used for both maintenance of the gas line and added to the CNF trail system as a designated nonmotorized trail. This alternative is 5.2 miles long and encompasses a temporary disturbance area of 26.8 acres, of which 6.3 acres would be required for a maintenance ROW. Under this alternative, the

[4] The locations of the Yellow and Purple Alternatives have been modified to reflect the September 2004 ADOT/FHWA proposed southbound SR 179 alignment on National Forest lands. Refer to Figure A-1 (Appendix A) to view the previous Draft EA and the September 2004 ADOT/FHWA alignments for these alternatives.

Key

Red Alternative

Coconino National Forest Boundary

Trailhead Key

(A) Cathedral Saddle Trailhead

(B) Little Horse Hub Trailhead

(C) Bell Rock North Trailhead

(D) Bell Rock Vista

(E) Bell Rock Pathway Hub Trailhead

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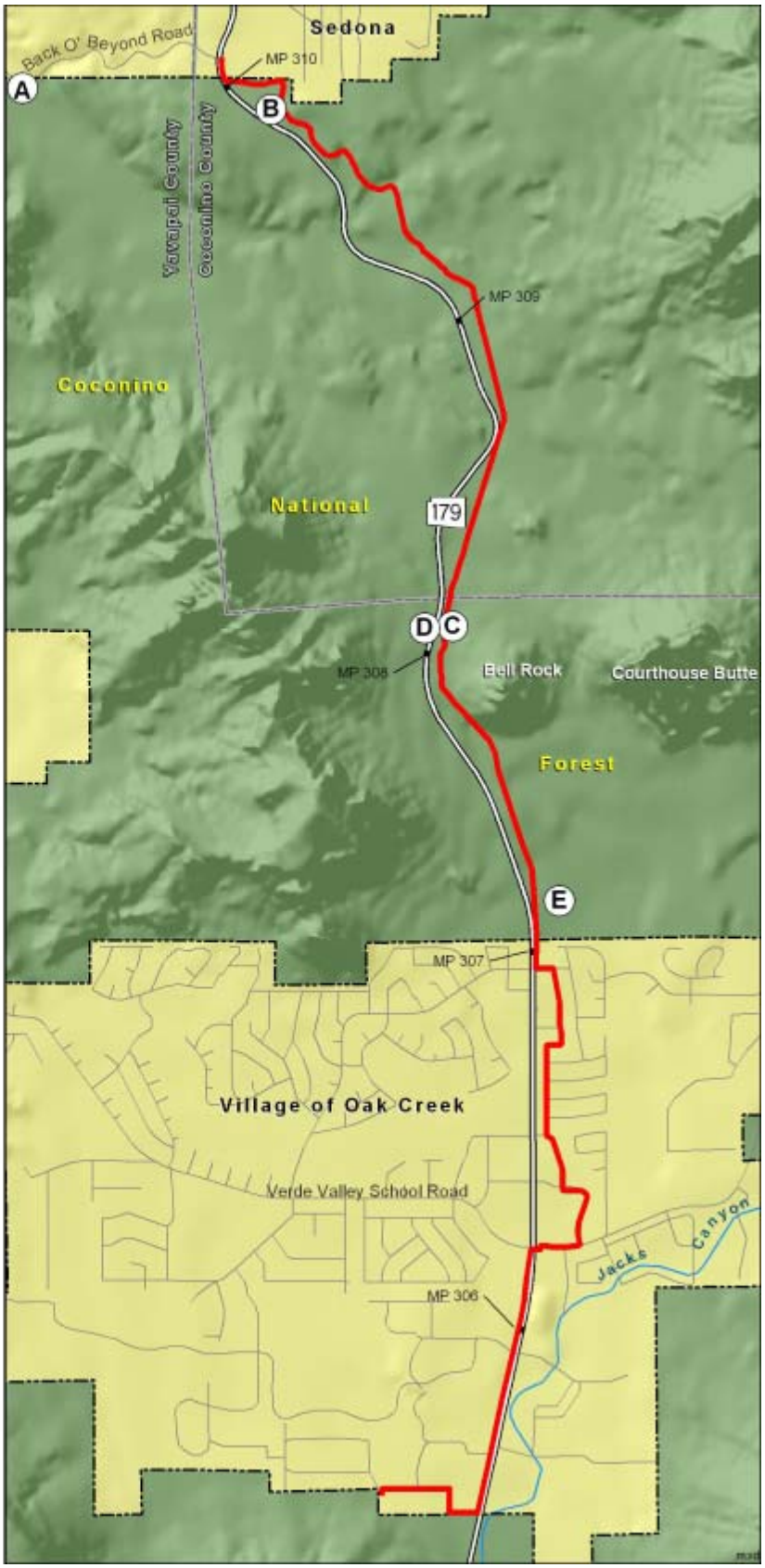

Figure II-3. Red Alternative

Key

Orange Alternative

Coconino National Forest Boundary

Trailhead Key

(A) Cathedral Saddle Trailhead

(B) Little Horse Hub Trailhead

(C) Bell Rock North Trailhead

(D) Bell Rock Vista

(E) Bell Rock Pathway Hub Trailhead

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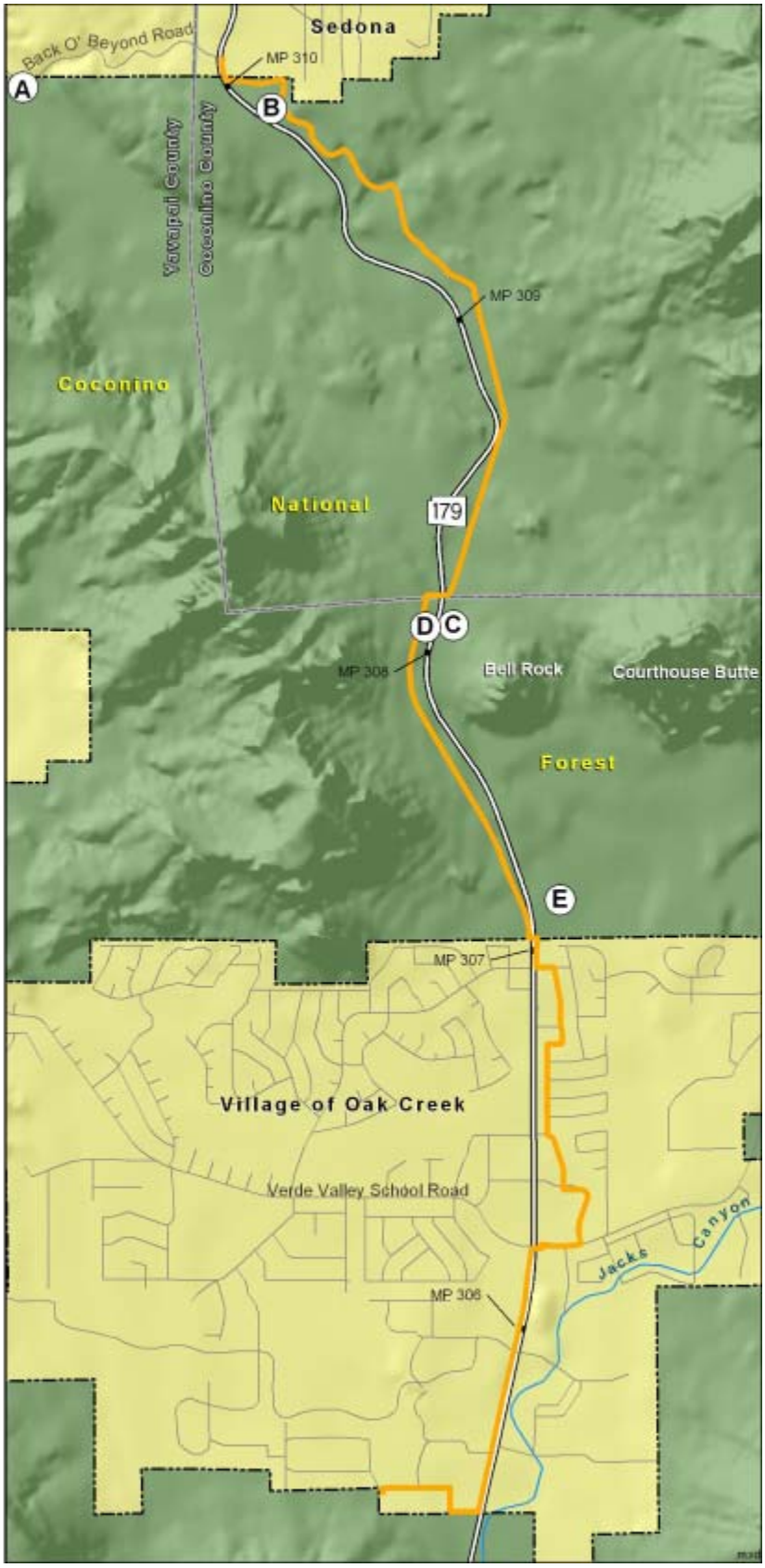

Figure II-4. Orange Alternative

Key

- Yellow Alternative
- Purple Alternative
- Coconino National Forest Boundary

Note: Yellow and Purple Alternatives follow the same alignment. Purple Alternative assumes ADOT's proposed SR 179 alignments are constructed. The location of the Yellow and Purple Alternatives has been modified to reflect the September 2004 ADOT/FHWA proposed southbound SR 179 alignment on National Forest lands. Refer to Figure A-1 (Appendix A) to view the previous Draft EA and the September 2004 ADOT/FHWA alignments for these alternatives.

Trailhead Key

- (A) Cathedral Saddle Trailhead
- (B) Little Horse Hub Trailhead
- (C) Bell Rock North Trailhead
- (D) Bell Rock Vista
- (E) Bell Rock Pathway Hub Trailhead

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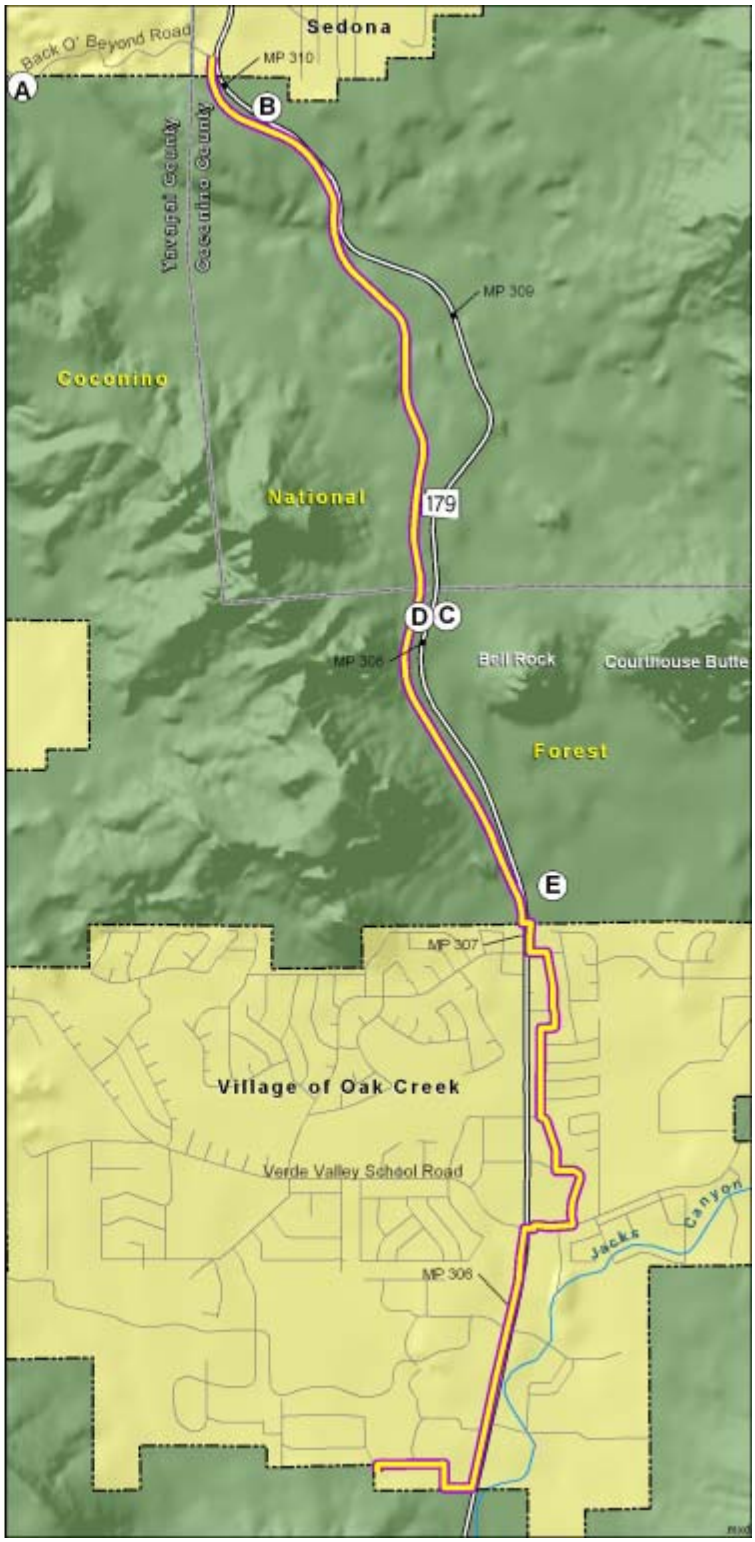

Figure II-5. Yellow and Purple Alternatives

required posts to demarcate the pipeline would be set off the trail, and information providing the distance to the pipeline would be provided on each post.

v. Purple Alternative

This alternative would follow along the southbound alignment of FHWA and ADOT's SR 179 EA, contiguous with the Yellow Alternative, and assumes that the highway would be built in this alignment after gas line construction (Figure II-5; II-6). This alternative is 5.2 miles long and encompasses a temporary disturbance area of 26.8 acres, of which 6.3 acres would be required for a maintenance ROW.

ADOT, in a letter dated June 30, 2004, committed to continue close communication with UES and CNF to integrate FHWA and ADOT's SR 179 EA proposed improvements with the gas line project to minimize construction impacts to the CNF. Additionally, ADOT has agreed to provide UES with cut and fill lines for its proposed improvements prior to construction of the pipeline.

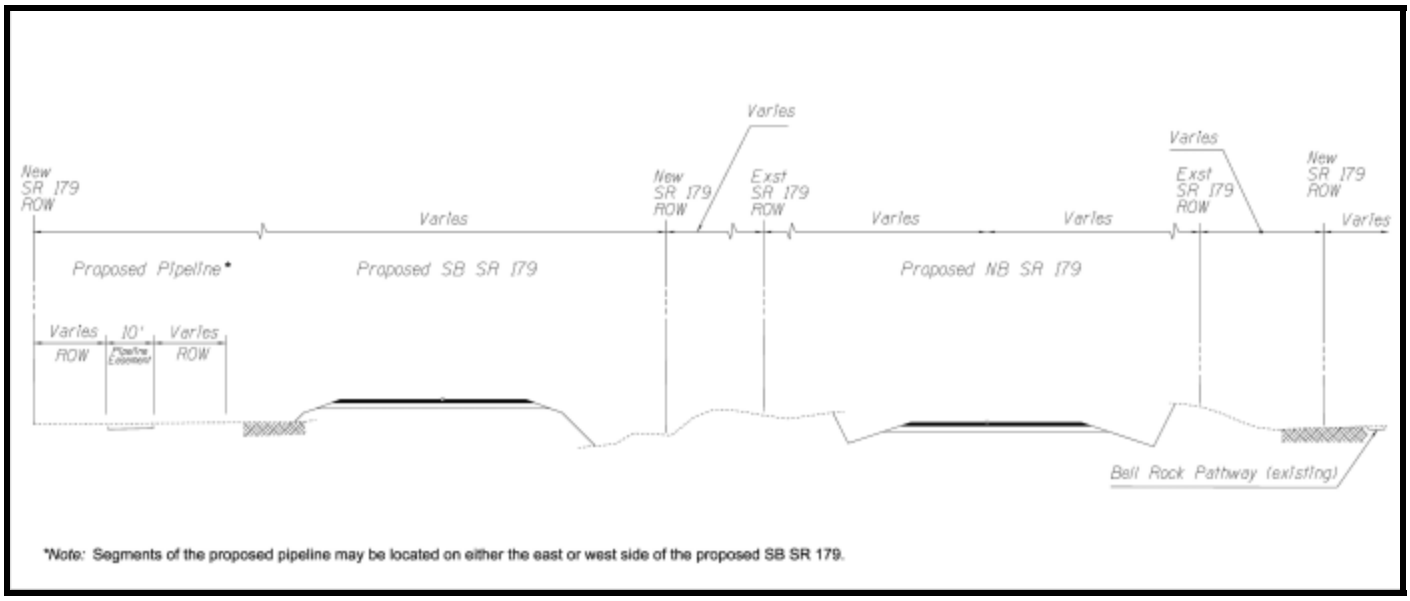

Figure II-6. Cross Section of the Purple Alternative

vi. No Action Alternative

Under the No Action Alternative, no pipeline would be constructed and no ground-disturbing activities would occur.

C. Alternative Comparison

Environmental consequences of alternatives considered in detail are discussed in Section III. Affected Environment and Environmental Consequences, and summarized below in Table II-1. Comparison of

Environmental Consequences Associated with build alternatives. Please note that the No Action Alternative is not included in the table, because it would have no direct, indirect, or cumulative impact on the natural/cultural environment; substantial differences and/or impacts are denoted in bold.

As shown in Table II-1 Comparison of Environmental Consequences Associated with build alternatives, approval of the Blue Alternative would result in visual and traffic impacts to the existing SR 179 roadway beyond any of the build alternatives. Unlike the Yellow Alternative, construction of the Blue Alternative would occur in predominant disturbed areas associated with the in-use roadway. Substantial traffic and access impacts would occur, because the two-lane SR 179 would be restricted to one lane of traffic directed by flagmen for safety associated with construction. Work along the roadway would also result in substantial negative short-term impacts to recreational driving along SR 179, because construction and access problems would impact the recreational experience of the drive. The removal of vegetation and modifications to the existing landforms would have subtle-to-notable adverse impacts on the scenic attractiveness of the landscape within the roadway corridor; however, these impacts would appear to be part of the already-disturbed roadway corridor. The pipeline would be completely visible by motorists traveling along this portion of SR 179 and, as well, from the new southbound roadway if constructed by ADOT. After the revegetation of the disturbed area, the presence of the pipeline would most likely not attract attention away from the natural landscape, and expectations of travelers along the designated scenic road would not be substantially altered. Visibility from the designated trails would vary depending on the trails' proximity to the pipeline. Within the immediate foreground area (within 300 feet of the trail), the pipeline alignment would be visible along 0.9 mile of the 3.6-mile-long Bell Rock Pathway.

The Red Alternative would have substantial negative impacts to Bell Rock, scenic resources, and recreation in the project area. This alternative would require cutting into the base of Bell Rock to construct the pipeline below the Bell Rock bedrock surface. The pipeline alignment would be visible for 2.2 miles of the Bell Rock Pathway and visible from the existing SR 179/Red Rock Scenic Road for approximately 2 miles. Because this alternative would follow Bell Rock Pathway for approximately 1.3 miles, the trail would be closed to through-traffic, noise would impact recreational users along the trail (and those trails connecting to this popular facility), and the Bell Rock Pathway would be permanently modified from its existing condition through cut and fill requirements and the addition of pipeline posts/markers. However, because the Red Alternative would follow the established trail, it would have less direct impact on undisturbed forest areas.

The Orange Alternative would also substantially impact Bell Rock Pathway (because it is contiguous with the Red Alternative north of the Yavapai/Coconino County boundary) and have similar effects on the existing scenic resources, as would the Red Alternative. Unlike the Red Alternative, it would cross SR 179 to avoid any disturbance to the base of the Bell Rock formation and, therefore, would impact a smaller portion of Bell Rock Pathway than the Red Alternative. However, south of this SR 179 crossover, the Orange Alternative would occur in a predominantly undisturbed landscape within the roadway corridor.

Table II-1. Comparison of Environmental Consequences Associated with Build Alternatives[a]

Consideration[b]	Blue Alternative	Red Alternative	Orange Alternative	Yellow Alternative	Purple Alternative
Project Area Disturbance	5.3 miles long; temporary disturbance of 27.4 acres. Permanent maintenance ROW of 6.4 acres.	5.4 miles long; temporary disturbance of 28.0 acres. Permanent maintenance ROW of 6.6 acres.	5.5 miles long; temporary disturbance of 28.4 acres. Permanent maintenance ROW of 6.7 acres.	5.2 miles long; temporary disturbance of 26.8 acres. Permanent maintenance ROW of 6.3 acres. **Construction occurs in predominantly undisturbed area.**	5.2 miles long; temporary disturbance area of 26.8 acres. Permanent maintenance ROW of 6.3 acres. **Construction within the footprint of ADOT's SR 179 EA southbound improvement route.**
SR 179 Traffic	**Construction along in-use SR 179 would result in substantial traffic delays.**	Minor impacts to SR 179 during construction in Sedona and the Village of Oak Creek.	Minor impacts to SR 179 during construction of cross-over and during installation in Sedona and the Village of Oak Creek.	Minor impacts to SR 179 during construction in Sedona and the Village of Oak Creek.	Minor impacts to SR 179 during construction in Sedona and the Village of Oak Creek.
Soil	Location relative to existing SR 179 would allow maintenance access from roadway and would occur in a partially disturbed area, minimizing impacts to soils. No disturbance to Bell Rock.	Construction along Bell Rock Pathway would occur in already disturbed soils. **Would require cutting into the base of Bell Rock.**	Construction along Bell Rock Pathway would occur in already disturbed soils. No disturbance to Bell Rock.	Construction in a predominantly undisturbed area; installation of a trail would increase overall soil disturbance, but may minimize soil disturbance from rogue trail use. No disturbance to Bell Rock.	Construction would occur in area that would be disturbed by the SR 179 footprint. Location relative to proposed SR 179 alignment would allow maintenance access from roadway and would occur in a partially disturbed area, minimizing impacts to soils. No disturbance to Bell Rock.
Cultural Resources[c]	74% of alternative surveyed for cultural resources; at least 3 sites may be impacted.	54% of alternative surveyed for cultural resources; at least 3 sites may be impacted.	61% of alternative surveyed for cultural resources; at least 2 sites may be impacted.	73% of alternative surveyed for cultural resources; at least 2 sites may be impacted.	73% of alternative surveyed for cultural resources; at least 2 sites may be impacted.

(table continued on page II-11)

Note: Substantial differences and/or impacts are denoted in bold.

[a] This table does not include the No Action Alternative, which would have no direct, indirect, or cumulative impact to natural or cultural resources.

[b] Vegetation, Invasive Species, Water Resources, Wildlife, Threatened and Endangered Species, Management Indicator Species, Wilderness, Air Quality, and Environmental Justice are not included in this table because the impacts are either identical in each alternative or differentiated solely by area amounts of less than 2 acres.

[c] Alignments have been partially surveyed for cultural resources; percentages include areas outside of National Forest land.

Table II-1. Comparison of Environmental Consequences Associated with Build Alternatives (*continued*)

Consideration	Blue Alternative	Red Alternative	Orange Alternative	Yellow Alternative	Purple Alternative
Scenic Resources	Construction of the pipeline would create subtle-to-notable adverse impacts on the scenic attractiveness of the landscape within the roadway corridor. Removal of trees within the 10-foot maintenance area would appear to be part of the already-disturbed corridor created by the roadway. Within the immediate foreground area[d] of Bell Rock Pathway, the pipeline alignment would be highly visible[e] along 0.9 mile of the 3.6-mile-long Pathway. The pipeline would not be visible from the Little Horse Trail. The pipeline would be 100% visible from the existing SR 179/Red Rock Scenic Road. If the new bifurcated highway were constructed, the pipeline would also be highly visible from the southbound roadway.	Construction of the pipeline coincident with the Bell Rock Pathway would create notable-to-major adverse impacts on the scenic attractiveness of the landscape. Major adverse impact on the scenic integrity of the landscape would result from the construction of the pipeline across the base of Bell Rock. Within the immediate foreground area of Bell Rock Pathway, the pipeline alignment would be highly visible along 2.2 miles of the 3.6-mile-long Pathway. The pipeline would be 82% visible from the existing SR 179/Red Rock Scenic Road. If the new bifurcated highway were constructed, the pipeline would also be 70% visible from the southbound roadway and 75% visible from the northbound roadway.	Construction of the pipeline coincident with the Bell Rock Pathway would create notable-to-major adverse impacts on the scenic attractiveness of the landscape. Within the immediate foreground area of Bell Rock Pathway, the pipeline alignment would be highly visible along 1.5 miles of the 3.6-mile long Pathway. The pipeline would be 80% visible from the existing SR 179/Red Rock Scenic Road. If the new bifurcated highway were constructed, the pipeline would also be 54% visible from the southbound roadway and 69% visible from the northbound roadway.	Construction of the pipeline would create subtle to major adverse impacts on the scenic attractiveness of the landscape and lower the level of naturalness of the landscape. Within the immediate foreground area of Bell Rock Pathway, the pipeline alignment would be highly visible along 0.2 mile of the 3.6-mile-long Pathway. The visibility of the pipeline would be from only the most northern segment (0.8 mile) of the Pathway. The pipeline would not be visible from the Little Horse Trail and Bell Rock Trail within the immediate foreground area. The pipeline would be 100% visible from the existing SR 179/Red Rock Scenic Road within the immediate foreground area. **The alignment would be the least visible from SR 179 and designated trails within the project vicinity (4-mile radius).**	Construction of the new SR 179 southbound roadway would mask the pipeline's impacts to the landscape's scenic resources. Construction of the pipeline would create subtle adverse impacts on the scenic attractiveness of the landscape. Within the immediate foreground area of Bell Rock Pathway, the pipeline alignment would be highly visible along 0.2 mile of the 3.6-mile-long Pathway. The visibility of the pipeline would be from only the most northern segment (0.8 mile) of the Pathway. The pipeline would not be visible from the Little Horse Trail and Bell Rock Trail within the immediate foreground area. The pipeline would be 100% visible from the existing SR 179/Red Rock Scenic Road and the new bifurcated highway were constructed.

(table continued on page II-12)

Note: Substantial differences and/or impacts are denoted in bold.

[d] Immediate foreground is the area within 300 feet of trail or SR 179.

[e] Visibility analysis assumed a worst-case scenario of a barren landscape without vegetation.

Table II-1. Comparison of Environmental Consequences Associated with Build Alternatives (*continued*)

Consideration	Blue Alternative	Red Alternative	Orange Alternative	Yellow Alternative	Purple Alternative
Recreation	Temporary closure/minor-moderate direct impact to: H.T. and Templeton Trails; Bell Rock North and Bell Rock Pathway Hub trailhead. **Substantial negative short-term impact to recreational driving on SR 179 (e.g., visual impact, traffic).** Minor restriction of trail-to-trail access throughout recreation system.	Temporary closure/ minor-moderate direct impact to: Little Horse, Bell Rock, and Templeton Trail; Little Horse Hub, and Bell Rock Pathway North trailhead. **Substantial negative short- and long-term impact to 1.3 miles of Bell Rock Pathway; permanent modification to Bell Rock formation.** Minor restriction of trail-to-trail access throughout recreation system.	Temporary closure/ minor-moderate direct impact to: Little Horse and Templeton Trail; Little Horse Hub and Bell Rock Pathway North trailhead. **Substantial negative short- and long-term impact to 1 mile of Bell Rock Pathway.** Minor restriction of trail-to-trail access throughout recreation system.	Temporary closure/ minor-moderate direct impact to: H.T. and Templeton Trails. **Moderate beneficial long-term impact by construction and maintenance of a new trail.** Minor restriction of trail-to-trail access throughout recreation system.	Temporary closure/minor-moderate direct impact to: H.T. and Templeton Trails. Negligible impact because of location in new ADOT SR 179 EA ROW. Minor restriction of trail-to-trail access throughout recreation system.

Note: Substantial differences and/or impacts are denoted in bold.

Unlike the Blue, Red, or Orange Alternatives, within the CNF the Yellow Alternative would be built entirely west of SR179—and therefore predominantly on undisturbed National Forest land. The Yellow Alternative assumes that the ADOT SR 179 EA southbound route is not constructed, and would result in new direct and indirect impacts to this area, essentially creating a new swath of disturbance in the forest. Construction of the Yellow Alternative would create subtle-to-substantial adverse impacts on the scenic attractiveness and lower the level of naturalness of the landscape. This alternative would be the least visible from the designated trails, including Bell Rock Pathway. The Yellow Alternative would be built in an area with few existing recreational facilities and have a beneficial impact to recreation because it would create a new trail connecting the Village of Oak Creek to Sedona.

Because the Purple Alternative assumes that the ADOT SR 179 EA southbound route would be constructed, this alignment would be built within the roadway improvement footprint. Therefore, the disturbance associated with this alternative would be entirely within an eventually disturbed area and would benefit from the landscaping and revegetation efforts associated with those roadway improvements. The presence of the roadway would also mask the pipeline's scenic resources impacts to the landscape. Like the Yellow Alternative, the Purple Alternative would be built west of SR 179, have similar visibility from the designated trails, and have a minimal impact to existing recreation—and no direct impact to Bell Rock or the Bell Rock Pathway. Unlike the Blue Alternative, this alignment would not require substantial traffic disruption on the existing SR 179 roadway in the CNF.

D. Mitigation Measures

Mitigation measures are actions that have been identified to minimize the impacts of the alternatives on social and natural environmental resources. The environmental consequences discussed in the following section are projected with the assumption that applicable mitigation measures are implemented. Some of the following mitigation measures are based on Best Management Practices found in the USFS *Southwestern Region's Soil and Water Conservation Practices Handbook* [#4], the *Coconino National Forest Land and Resource Management Plan* [#5], archaeological compliance reports related to this project, and direction from CNF.

Any archaeological sites discovered during construction will be mitigated pursuant to all applicable laws and regulations.

In the following table, the Effectiveness Rating (ER) column presents numeric data representing the effectiveness of respective mitigation measures and is based on research and past experience/projects. The numeric scale is as follows:

(1) Almost always significantly reduces impacts. Almost always done in this situation.

(2) Usually significantly reduces impacts. Often done in this situation.

(3) Effectiveness monitoring will be conducted during project implementation and at other appropriate times

Table II-2. Mitigation Measures Required for Action Alternatives

No.	Mitigation	Reason	ER	Alternative
		SOIL		
S1[a]	Soils would be managed according to direction in the *Coconino National Forest Land and Resource Management Plan*.	To emphasize maintenance of soil productivity.	1	All Build Alternatives
S2	A Stormwater Pollution Prevention Plan (SWPPP) would be prepared and adhered to (which would include an erosion control plan).	To mitigate soil movement expected during construction.	1	All Build Alternatives
S3	Where possible, vegetation would be sheared or trampled.	To allow for retention of as much topsoil as possible.	2	All Build Alternatives
S4	Where feasible, a minimum of the top 6 inches of soil would be segregated from the subsoil and stored apart from the subsoil; once the pipe is placed and the subsoil backfilled and compacted, the topsoil shall be replaced on top of the trench.	To allow for retention of as much topsoil as possible.	2	All Build Alternatives
S5	The locations of the staging areas would be limited to three locations, coordinated with CNF, and use existing cleared areas where possible.	To limit soil disturbance.	2	All Build Alternatives
S6	Temporary fencing or flagging would be used to restrict construction activities to the designated limits of disturbance.	To limit soil disturbance.	2	All Build Alternatives
S7	Disturbed areas would be recontoured to return the site to the approximate original ground surface.	To reduce possible increases in surface erosion.	2	All Build Alternatives
S8	Construction equipment would not be operated when ground conditions are such that unacceptable soil compaction or displacement could occur.	To minimize erosion.	2	All Build Alternatives
S9	Portions of the permanent maintenance ROW that are trails and not revegetated would be shaped and drained appropriately.	To limit erosion.	1	All Build Alternatives

(table continued on page II–15)

[a] Also refer to revegetation mitigation measures for VEGETATION/INVASIVE SPECIES and SCENIC RESOURCES (e.g., V1; V2; SR 5; SR 7), which will also aid in the prevention of erosion and sedimentation.

Table II-2. Mitigation Measures Required for Action Alternatives (*continued*)

VEGETATION/INVASIVE SPECIES				
V1	Where possible, vegetation would be sheared or trampled instead of removed.	To minimize the amount of revegetation needed.	2	All Build Alternatives
V2	In undeveloped areas not on designated trails, this 10-foot-wide maintenance ROW would be seeded with grasses.	To minimize vegetation impacts.	2	All Build Alternatives
V3	The locations of the staging areas would be limited to three locations, coordinated with CNF, and use existing cleared areas where possible.	To minimize vegetation impacts.	1	All Build Alternatives
V4	Temporary fencing or flagging would be used to restrict construction activities to the designated limits of disturbance.	To minimize the area of vegetation impacts.	1	All Build Alternatives
V5	Construction and maintenance equipment would be kept free of invasive species by washing the equipment prior to entering the construction site, prior to moving equipment from infested to noninfested areas of the project, and prior to departing the site.	To prevent the spread of invasive species seed.	1	All Build Alternatives
V6	The location of the wash site in the project limits would be reported to CNF for future monitoring.	To prevent the spread of invasive species seed.	2	All Build Alternatives
V7	Upon completion of construction, revegetation with native seed would be required.	To prevent the spread of invasive species seed.	2	All Build Alternatives
V8	Any fill, seed, or mulch material brought in from off-site would be free of invasive species seed.	To prevent the spread of invasive species seed.	2	All Build Alternatives
V9	Invasive species that are present within the construction corridor would be mitigated to further prevent the spread of invasive species seed.	To prevent the spread of invasive species seed.	1	All Build Alternatives
V10	A mitigation plan would be developed for invasive species within the construction zone.	To prevent the spread of invasive species seed.	2	All Build Alternatives
WATER RESOURCES				
W1	Construction personnel would adhere to the terms and conditions of applicable US Army Corps of Engineers Section 404 permit(s).	To minimize impacts to waters under the jurisdiction of the US Army Corps of Engineers in compliance with Section 404 of the Clean Water Act.	1	All Build Alternatives
W2	Any required Section 404/Section 401 Water Quality Certification would be obtained prior to construction.	To minimize impact to water quality in compliance with Section 401 of the Clean Water Act.	1	All Build Alternatives
W3	In compliance with Section 402(p) of the Clean Water Act, an Arizona Pollutant Discharge Elimination System (AZPDES) general permit would be obtained.	To minimize impacts to water quality in compliance with Section 402 of the Clean Water Act.	1	All Build Alternatives
W4	A SWPPP would be prepared.	To minimize impacts to water quality in compliance with Section 402 of the Clean Water Act.	1	All Build Alternatives
W5	UES would ensure regular maintenance of the maintenance vehicles.	To limit the leaking of hazardous materials (e.g., gasoline) into streams or onto permeable soil.	2	All Build Alternatives

(table continued on page II–16)

Table II-2. Mitigation Measures Required for Action Alternatives (*continued*)

W6	Construction equipment would not be fueled or services within or near channels, streams, or other watercourses.	To prevent pollutants from being discharged into watercourses.	2	All Build Alternatives
CULTURAL RESOURCES				
C1	Prior to ground-disturbing activities, an intensive pedestrian survey of all previously unsurveyed portions of the project limits in compliance with CNF requirements, Section 106 of the National Historic Preservation Act, and the State Historic Preservation Act would occur.	To ensure identification of significant cultural resources.	1	All Build Alternatives
C2	Prior to construction, UES would coordinate with CNF regarding the location of the three staging areas, to ensure that they are located outside the boundaries of any known cultural resource sites.	To ensure the project does not have an adverse effect on significant cultural resources.	1	All Build Alternatives
C3	UES would coordinated with CNF and complete any required site treatment prior to ground-disturbing activities.	To ensure the project does not have an adverse effect on significant cultural resources.	1	All Build Alternatives
C4	If any cultural resource sites are discovered during construction and/or clearing, all operations would immediately cease, and CNF would be immediately contacted.	To protect previously unidentified cultural resources.	1	All Build Alternatives
SCENIC RESOURCES				
SR 1	Installed pipeline markers would be of a CNF-approved color.	To minimize scenic resources impact.	2	All Build Alternatives
SR2	To minimize ground disturbance, construction access on National Forest lands would be preapproved by CNF and shown on the project plans.	To minimize scenic resources impact.	1	All Build Alternatives
SR3	Any staging areas or other construction-related activities would occur within the designated limits of disturbance.	To minimize scenic resources impact.	1	All Build Alternatives
SR4	No construction vehicle movement would occur on National Forest lands outside the construction access limits.	To minimize scenic resources impact.	1	All Build Alternatives
SR5	Vegetation would be preserved and protected outside of the specified clearing limits. The contractor would remove trees only when specifically authorized to do so by CNF and would avoid damaging vegetation that is to remain in place.	To minimize scenic resources impact.	1	All Build Alternatives
SR6	A resource protection plan would be included in the construction documents to identify sensitive areas such as natural rock outcrops within the project limits that would need to be protected from construction impacts.	To minimize scenic resources impact.	2	All Build Alternatives
SR7	Revegetation would occur in a progressive manner once a portion of the pipeline has been completed.	To minimize scenic resources impact.	1	All Build Alternatives
SR8	Slashings (tree trunks, branches, stumps, cacti, and other vegetation) and excess rock and soil material resulting from clearing operations on National Forest land would be deposited in sites approved by CNF. Brush	To minimize scenic resources impact.	2	All Build Alternatives

(table continued on page II–17)

Table II-2. Mitigation Measures Required for Action Alternatives (*continued*)

SR8 (cont)	or roots would be chipped and spread at approved sites in a natural, unobtrusive manner.	To minimize scenic resources impact.	2	All Build Alternatives
SR9	A depth of 1–2 feet of porous fill would be provided around trees adjacent to the toes of slopes. Tree wells and/or other techniques would be used to extend the preservation of vegetation at the edge of the clearing limits as agreed upon by CNF and UES.	To minimize scenic resources impact.	2	All Build Alternatives
SR10	Any riprap used in the project would blend with the surrounding rock and exposed soil color.	To minimize scenic resources impact.	1	All Build Alternatives
SR11	To blend with natural rock features, newly exposed rock faces would incorporate characteristics of the adjacent natural rock to include scale, shape, slope, and fracturing to the extent that is practicable and feasible. Exposed rock cuts would be evaluated for use of chemical staining to blend with adjacent natural rock.	To minimize scenic resources impact.	1	All Build Alternatives
SR12	Cut slopes would simulate the terrain of the surrounding area. Cut fill slopes would be constructed with varied slope ratios to leave an irregular, undulating, or roughened appearance rather than a uniform grade. Slope ratios would vary from the top to the bottom of the slope face and from station to station.	To minimize scenic resources impact.	1	All Build Alternatives
SR13	Boulders excavated during construction would be considered for use as riprap and facing accents on structures if the rock is competent and as approved by CNF for use as barrier rock in off-road locations. Boulders not used for construction needs would be placed in areas where natural rock outcrops exist. These boulders would be placed in random patterns and be partially buried to simulate natural boulders in the landscape.	To minimize scenic resources impact.	1	All Build Alternatives
SR14	Rock outcrops within the project limits would be left in place if stable and if not creating a hazard to the traveling public, interfering with construction, or appearing out of place in the natural landscape.	To minimize scenic resources impact.	1	All Build Alternatives
SR15	Clearing limits within National Forest lands would be irregular and staked by the contractor for approval by CNF and UES prior to the start of clearing. Limits of clearing would generally extend from the top of slope cuts (including rounding) to the toe of fills. Straight clearing lines would be avoided where possible by varying the width of the area to be cleared or by leaving selected clumps of vegetation near the edge of the clearing limit. Tree wells and/or other techniques would be used to extend the preservation of vegetation at the edge of clearing limits as agreed upon by CNF and UES.	To minimize scenic resources impact.	1	All Build Alternatives

(table continued on page II–18)

Table II-2. Mitigation Measures Required for Action Alternatives (*continued*)

SR16	Mature vegetation would be avoided to the extent practicable by bending or realigning the pipeline alignment in critical areas as determined in the resource protection plans.	To minimize scenic resources impact.	1	All Build Alternatives
SR17	The spoil area and parallel working zone would not require clearing and grubbing of the landscape. Vegetation in the spoil area and working zone would be sheared to keep the topsoil from being displaced. Vegetation would be trampled rather than removed.	To minimize scenic resources impact.	1	All Build Alternatives
SR18	The pipe alignment would bend in some areas to limit sight lines along the alignment to reduce impacts associated with the clearing of the ROW.	To minimize scenic resources impact.	1	All Build Alternatives
SR19	UES would rebuild portions of the Bell Rock Pathway surface impacted during construction.	To minimize scenic resources impact.	1	Red and Orange Alternatives
SR20	Prior to construction, CNF and UES representatives would walk the alignment along the Bell Rock Pathway and identify areas that would be classified as high-impact locations. These high-impact locations would require additional care to sustain the look and feel of the current pathway. Irrigation would be required only in the high-impact areas as identified by CNF. Restoration of the remaining areas of disturbance created by the pipeline construction would also be necessary, but UES would not be required to install boxed trees or containerized plant material in non-high-impact locations.	To minimize scenic resources impact.	1	Red and Orange Alternatives
SR21	A hydroseed mix of grasses and forbs would be used to revegetate the 10-foot-wide permanent maintenance ROW. The hydroseed mix would be approved by CNF prior to construction. The revegetation material for the remaining 30 feet of disturbance within the 40-foot-wide pipeline corridor would contain 24-inch-box-; 1-gallon-; and 5-gallon-size trees to achieve a density of 1,090 trees per acre of temporary disturbance. Yucca, beargrass, and agave plants would be salvaged and replanted in the 30-foot-wide temporary area of disturbance. A temporary irrigation system would be installed for the container plantings. A landscape establishment period of up to 48 months would be required or upon CNF approval.	To minimize scenic resources impact.	1	Red and Orange Alternatives
SR22	A hydroseed mix of grasses and forbs would be used to revegetate the 10-foot-wide permanent maintenance ROW. The revegetation material for the remaining 30 feet of disturbance within the 40-foot-wide pipeline corridor would be a hydroseed mix containing grasses, forbs, shrubs, and trees. Both of the hydroseed mixtures would	To minimize scenic resources impact.	1	Blue, Yellow, and Purple Alternatives

(table continued on page II–19)

Table II-2. Mitigation Measures Required for Action Alternatives (*continued*)

SR22 (cont)	be approved by CNF prior to construction. A landscape establishment period of up to 36 months would be required or upon CNF approval.	To minimize scenic resources impact.	1	Blue, Yellow, and Purple Alternatives
SR23	After the completion of ADOT's proposed roadway construction, UES would coordinate with CNF to identify any additional revegetation efforts in areas within the pipeline's footprint not impacted by the roadway construction project. The revegetation material would contain 24-inch-box-; 1-gallon-; and 5-gallon-size trees to achieve a density of 1,090 trees per acre of temporary disturbance. A temporary irrigation system would be installed for the container plantings. A landscape establishment period of up to 48 months would be required or upon CNF approval.	To minimize scenic resources impact.	2	Purple Alternative
RECREATION/WILDERNESS				
R1	UES would coordinate with CNF prior to construction, to determine appropriate signs and public notification for any trail closures required for construction, maintenance, or emergency access.	To minimize the impacts of construction/ maintenance/emergency situations on existing recreation within the CNF.	2	All Build Alternatives
R2	Segments of the maintenance easement diverting from established trails would be temporarily blocked from public access for vegetation restoration.	To minimize rogue trail use.	2	Red and Orange Alternatives
R3	To minimize the impacts of construction on recreation, when feasible, construction requiring full closures of existing recreational facilities would not occur on weekends or holidays.	To minimize the impacts of construction on users of existing recreational facilities.	2	Blue, Yellow, and Purple Alternatives
AIR QUALITY				
A1	Dust generated during construction would be controlled by watering and/or other dust abatement measures.	To minimize the amount of dust created during construction.	2	All Build Alternatives
A2	UES would ensure proper maintenance of construction equipment.	To minimize exhaust emissions (e.g., carbon monoxide, nitrogen oxide, hydrocarbons, particulate matter) during construction.	2	All Build Alternatives

E. Monitoring

All projects on USFS land require periodic evaluation of resources and/or activities (often on a representative sample basis) to identify long-term trends, assess the impacts of land management activities, determine success in achieving objectives, and to verify compliance with established standards. The majority of monitoring activities would be ongoing as the project progresses. The mitigation measures described in Table II-2 also include monitoring activities. UES will be responsible for monitoring under its permit or easement, if approved, and will ensure that monitoring is completed. A USFS representative would monitor ground-disturbing activities on-site during construction and would periodically visit the site following construction to monitor ongoing use of the site and constructed facilities.