# ALTERNATIVES

On February 28, 2013, an interdisciplinary team (IDT) of National Park Service employees met to develop alternatives for this project. In addition, the IDT tried to design alternatives that minimized new disturbance, avoided habitat disruption for threatened and endangered species, and reduced impacts to natural and cultural resources. Each alternative was designed to meet the following objectives of the proposed pipeline project. These objectives are:

1. To restore a permanent, reliable source of water to the park that would provide many years of service to the public and park employees.
2. To design the project such that the pipeline is not damaged by natural events such as wildfires and below-freezing temperatures, which occur periodically at the park.
3. To restore the disturbed natural resources and cultural landscape to a more natural state.
4. To minimize impacts to cave/karst resources.

## ACTIONS COMMON TO ALL ALTERNATIVES

The following actions are required regardless of the alternative chosen, including the No-Action alternative.

- The park's existing waterline will be maintained as necessary to keep it working.
- Water will be made available at all times, including periods of high visitation.

**Fig. 1 Photo of Waterline and Damaged Asbestos Jacket after Loop Fire in 2011**

The fire-damaged asbestos jacket was completely removed from the operational section of the pipeline in November 2012. This was done to mitigate the hazards of working in the area and to prevent deteriorated insulation from being dispersed over the landscape. Loose pieces of the

asbestos insulation from the pipeline and surrounding area were recovered and disposed as part of the project. See Figure 2 below for a photo of waterline in its present condition.

## ALTERNATIVE A - NO ACTION

Description: Under the No Action Alternative, there would be no change to the existing above-ground pipeline. The pipeline is presently in use for distribution of potable water to the visitor center, park offices, housing units, and fire protection systems. The park would continue to operate the pipeline in its present, un-insulated condition (Figure 2).

**Fig. 2 – Photo of Existing Waterline in Its Present Condition with Asbestos Jacket Removed.**

The structural integrity of this pipeline is threatened by the loss of the asbestos insulation jacket and damage to over 100 wooden support blocks. Removal of the asbestos insulation has subjected the pipeline to possible damage from freezing temperatures as well as wildfires. Loss of the support blocks may lead to a structural failure of the pipeline due to movement of the line caused by changes in water pressure. The possibility exists for major disruptions to water service. Under the No-Action Alternative, the NPS would respond to service outages as follows:

**Temporary freezing of water inside the pipe:**
Freezing events have occurred on this pipeline several times over the last 7 years, even with the insulation jacket in place. It is not possible to thaw out a 6930 foot-long pipeline without bringing in a lot of specialized equipment and a commensurate expenditure of funds. In this situation, the only option available to the park is to wait for warmer weather to thaw out the

pipeline. Service outages could last several days, or longer. The park would close. Portable toilets and containerized drinking water would be brought in to serve residents during the outage.

**Pipeline leak due to movement or single rupture:**
Maintenance crew would install repair clamp or couplings to stop the leak. Brief service outage (2 hours) could result. An inventory of appropriate repair kits would be maintained on site for quick response.

**Hard Freeze resulting in multiple pipeline ruptures:**
Maintenance crew would install repair clamps or couplings to stop the leaks. Longer service outages would be likely. Even after repairs were completed, the pipeline could still be frozen and out of service for a week or longer.

**Pipeline Failure:**
During the February 2011 "deep freeze," the park's smaller 4" water transmission line froze solid, damaging nearly every pipeline section in multiple places. The entire 3000-foot pipeline had to be replaced at a cost of over $600,000. That project took 9 months to execute, including planning and construction. If this distribution pipeline was destroyed in a similar event, the impact to park operations would be comparable.

Advantages:

- "Zero" cost to implement.
- "Zero" impact.

Disadvantages:

- High probability of leaks at pipe joints, caused by failed support blocks and pipeline movement.
- High probability of extended service interruptions (freezing) during periods of cold weather.
- High probability of pipeline ruptures caused by freezing.
- Increased frequency and costs for pipeline maintenance and repair.
- Potential loss of investment (complete pipeline failure) due to hard freezing and multiple ruptures.
- Potential for park closures and relocation of employees who occupy Government housing.

The removal of the asbestos insulation has subjected the pipeline to possible damage from freezing temperatures as well as wildfires. The loss of the support blocks may lead to a structural failing of the pipeline due to movement of the line caused by changes in water pressure. The possibility exists for a major disruption to water service. Should the No-Action alternative be selected, the NPS would respond to future needs and conditions associated with the Mesa Top Waterline without major actions or changes in course.

## ALTERNATIVE B- Repairs to Existing Waterline ($750,000)

Description: Under Alternative B, repairs would be made to the existing above-ground pipeline. The approximate cost of this alternative would be $750,000. In-kind materials, equipment and construction methods would be used, including the use of fire-proof insulation. The work would be conducted along the existing pipeline location, within the same 50-foot wide corridor and footprint.

This alternative restores the pre-existing condition. The burned pipeline support blocks would be replaced and a new insulation jacket would be installed. The work would involve careful jacking of the pipe at all support blocks, demolition and replacement of treated wood supports, reinstalling restraining clamps, and fitting and attaching rigid 2" pipe insulation jacketing with metal cover.

In a typical work scenario, materials would be moved from the Main Storage Area to the Secondary Staging areas, as needed. A 4-person hand crew and a UTV or pickup truck, would be used to carry tools and materials to the work areas, adjacent to the pipeline. Pipeline support blocks (treated wood) would be pre-fabricated and brought to the worksite to minimize production and scatter of chemically-treated waste material. Cutting/fitting of Styrofoam insulation and jacketing materials would be done on-site. Demolished and scrap materials would be accumulated in the Secondary Staging areas and removed periodically.

The Area of Potential Effect (APE) would be approximately 6,930 feet long X 50 feet wide. The area is sparsely vegetated, partially due to the 2011 Loop Fire. Some revegetation work would be required.

Advantages:

- Lowest "installed cost," compared to other Alternatives.
- Least impacting option – most work done by hand. Heavy equipment not required.
- Defers replacing pipeline to save costs (short-term advantage).
- Construction work does not require any service interruption.

Disadvantages:

- Susceptibility of pipeline to freezing and destruction of insulation jacket by fire, remains.
- Potential for leaks in the 40 year-old pipe joints, during jacking and resetting operations.
- Additional periodic maintenance (painting) required to maintain aesthetics (camouflage).
- Visual impairment of natural landscape remains on a park "scenic route."


Fig.3- Example of Charred Support Blocks Requiring Replacement Under Alternative B.

## ALTERNATIVE C- Complete Replacement with Above-ground Waterline

Description: Under Alternative C, the existing 40 year-old pipeline would be replaced with a *new, **in-kind, above-ground pipeline***. The pipeline would be 6,930 feet long, and would be constructed using in-kind materials, equipment and construction methods, including the use of fire-resistant insulation. The work would be conducted along the existing pipeline location, within the same 50-foot corridor and footprint.

This alternative installs a new above-ground pipeline immediately adjacent to the existing pipeline. New concrete support saddles and a new 2" insulation jacket with a metal cover would be installed. In a typical work scenario, materials would be moved from the Main Storage Area to the Secondary Staging areas, as needed. A 4-person hand crew and a UTV or pickup truck, would be used to carry tools and materials to the work areas, adjacent to the new pipeline construction. Approximately 700 new concrete saddles would be either cast-in-place or pre-fabricated and set in place. Drilling into the rock for the attachment of new concrete saddles would be required. The new pipeline would be bolted to the concrete saddles. Following construction, of the pipeline, it would be disinfected and tested for leaks. Insulation would be installed following testing.

Demolition of the old pipeline would occur in the next phase of the construction project. Demolition would include removal of all old above-ground pipeline and support blocks. Roll-off dumpsters, placed at existing road pullouts, would be used to hold demolished materials. As a dumpster is filled, it would be picked up and taken to an offsite disposal facility.

The final phase of the project would be restoration of the disturbed areas. Area of Potential Effect (APE) would be approximately 7000 feet long X 50 feet wide. The area is sparsely vegetated, partially due to the recent wildfire. Significant revegetation work would be required.

Advantages:

- Provides a new pipeline, replacing a 40 year-old line nearing the end of its service life.
- Reduces potential for freezing of pipeline and/or destruction of insulation jacket by fire.
- Provides a new pipeline with an expected service life of 50 – 75 years.

Disadvantages:

- Does not eliminate potential for freezing of pipeline and/or destruction of insulation jacket by fire.
- Requires periodic maintenance (i.e., painting) to maintain aesthetics.
- Above ground installation impairs the view of the natural landscape on a park "scenic route."
- Construction work will be noisy and create a temporary impact to the "soundscape."
- Brief service interruptions will occur when the pipeline is connected to the water system.

Description: Under Alternative C, the existing pipeline would be replaced with a new, in-kind, above-ground pipeline. The pipeline would be constructed using in-kind materials, equipment and construction methods, including the use of fire-proof insulation. The work would be conducted along the existing pipeline location, within the same corridor and footprint.

Demolition of the old pipeline would occur in the next phase of the construction project. Demolition would include removal of all old above-ground pipeline and support blocks. Roll-off dumpsters, placed at existing road pullouts, would be used to hold demolished materials. As a dumpster is filled, it would be picked up and taken to an offsite disposal facility.

## ALTERNATIVE D- Complete Replacement with Buried Pipeline ($900,000)

Description: Under Alternative D, the existing pipeline would be replaced with a *new,* ***buried pipeline***. The estimated cost of this alternative would be $900,000. The pipeline would be constructed and buried along the existing pipeline location, within the same corridor and footprint. A ground-penetrating radar survey would be conducted prior to any excavation work. The construction specifications would entail a 50-foot work corridor width (i.e. footprint of vehicles and equipment traversing) and a trench 24 inches deep and 12 inches wide. The pipe would be 6" diameter roll pipe or equivalent. The trenching work would be accomplished by a rock-saw, which creates relatively less noise than a jackhammer operation.

This alternative would install a new pipeline in a shallow, excavated trench, immediately adjacent to the existing pipeline. This allows the park to continue using the existing above-

ground pipeline to supply its water needs during construction. Upon completion of the work, the existing above-ground pipeline would be demolished and removed. Pursuing this option is predicated upon results of a Ground Penetrating Radar (GPR) survey, which is clear of karst features near the ground surface, along the pipeline route.

In this scenario, a heavy rock saw would be used to excavate a trench approximately 12" wide X 24" deep, over the entire length of the pipeline. The rock saw trenching operation would take place in a narrow corridor, as compared to other methods, such as a demolition hammer and trackhoe. With a rock saw, the "spoil pile" is placed right next to the trench in a neat windrow. The material excavated by the rock saw is pulverized, making it suitable for bedding and backfill operations. This precludes additional resource impacts caused by hauling in borrow material for backfilling.

Upon completion of the trenching operation, construction of an 8" pipeline would begin. The type of pipe material would be either epoxy-coated steel or fusion-joined High-Density Polyethylene (HDPE). Installation equipment used would depend upon the type of pipe chosen. For epoxy-coated steel, a small rubber-tracked loader or trackhoe would be used to lift and lay the pipeline sections in the trench. For fusion-joined HDPE, special machinery is required. In either case, the equipment used would operate within the designated Area of Potential Effect (APE) and would have similar environmental impacts.

Following construction of the pipeline, it would be disinfected and tested for leaks. After testing, the pipeline would be backfilled and compacted. A typical backfilling operation might include using a loader or grader to backdrag the spoil pile into the trench. Mechanical compaction would follow, using a skid-steer loader or trackhoe and a vibratory compactor, over the area.

Upon completion of backfilling operations, and prior to demolition of the surface-laid pipeline, the new distribution pipe would be connected to the park's water system. The old line would be taken out of service at this time.

Demolition of the old pipeline would occur in the next phase of the construction project. Demolition would include removal of all old above-ground pipeline and support blocks, including the abandoned portion (2,100 feet) of the pipeline that extends west of the Main Water Storage Tank. Roll-off dumpsters, placed at existing road pullouts, would be used to hold demolished materials. As a dumpster is filled, it would be picked up and taken to an offsite disposal facility.

The final phase of the project would be restoration of the disturbed areas. Area of Potential Effect (APE) would be approximately 8400 feet long X 50 feet wide. The area is sparsely vegetated, partially due to the recent wildfire. Significant revegetation work would be required.

The completed project would leave the one-million gallon storage reservoir as the only visible component of the water distribution system on the top of the Escarpment.

Advantages:

- Protects investment in this asset over the long-term.

- Eliminates potential for freezing of pipeline and destruction of insulation jacket by fire.
- Provides a new pipeline with an expected service life of 50 – 75 years.
- Requires no periodic maintenance (i.e., painting) to maintain aesthetics.
- Significantly reduces a visual impairment of the natural landscape on a park "scenic route."
- Removes a "sediment trap" that exists in the current pipeline where it passes under the road.

Disadvantages:

- Use of heavy equipment is required, which will create a temporary scar on the landscape.
- Construction work will be noisy and create a temporary impact to the "soundscape."
- Brief service interruptions will occur when the pipeline is connected to the water system.

**Fig.4 Types of Trenching Machinery as Described in Alternative D.**

## ALTERNATIVE E- Remove Water Distribution System and Replace with Continuous Feed Pumping System ($1.9 million)

Description: Under Alternative E, the existing pipeline and storage tank would be removed and replaced with a *pressure-regulated pump system* which would connect directly to the park's existing distribution line connection point. The estimated cost of this alternative is $1.9 million. The connection point is located just below the visitor center. The pumps would operate in an on-demand manner. The existing above-ground water line and storage tank would be removed.

This alternative would replace the existing water distribution system on top of the Escarpment with a continuous-feed pumping system located at the bottom of the Escarpment. The continuous feed pumping system would utilize some components of the existing water transmission system, including the 250,000-gallon storage reservoir and Treatment Plant building located at the bottom of the Escarpment. At the end of the construction phase, the existing water distribution system on top of the escarpment would be demolished and removed.

Construction of a new water distribution system at the bottom of the Escarpment would require the following new components:

- 3000 feet of new 6" epoxy-coated steel pipeline (to maintain similar engineered flow capacity)

- 2 continuous-feed pumps (main and backup) for "domestic" use
- 1 emergency fire pump
- Standby electrical generator
- Hydro-pneumatic pressure tank

The construction phase would proceed with careful excavation of a new 3000-foot long trench in the arroyo where the existing water pipeline is installed (known as the Up the Escarpment Pipeline). A new 6" epoxy-coated steel pipeline would be laid, adjacent to the existing 4" line. The new 6" line would be connected to the existing 8" water distribution line at the top of the Escarpment. At the bottom end, existing transfer piping and associated control valves would be excavated and replaced with larger units, to accommodate the increased flow requirements. At the Treatment Plant, existing pumps would be replaced with units designed for continuous feed operation. A new fire pump would be installed to handle increased flow and pressure demand for fire suppression systems and remote fire hydrant operation. Electrical service capacity at the Treatment Plant facility would be upgraded to handle the increased demand of the new pumps. To ensure reliability of the water supply, a 45KVa diesel-powered electric generator would be installed to provide power in the event of commercial service interruptions.

Demolition of the old pipeline would occur in the next phase of the construction project. Demolition would include removal of all old above-ground pipeline and support blocks. Roll-off dumpsters, placed at existing road pullouts, would be used to hold demolished materials. As a dumpster is filled, it would be picked up and taken to an offsite disposal facility.

The final phase of the project would be restoration of the disturbed areas. Area of Potential Effect (APE) would be approximately 11,000 feet long X 50 feet wide. The Escarpment topside area is sparsely vegetated, partially due to the recent wildfire. Significant revegetation and restoration work would be required along the pipeline. The pipeline construction area down the arroyo is already impacted from a recent pipeline replacement project.

This Alternative completely eliminates all components of the water distribution system on the top of the Escarpment. However, there are short-term and long-term drawbacks including: significantly higher upfront construction costs, installation of additional equipment that will require periodic maintenance/replacement, installation of a diesel generator and associated fuel storage facility, and much higher annual operating costs for continuously running pumps and fuel.

Advantages:

- Eliminates potential for freezing of pipeline and destruction of insulation jacket by fire.
- Provides a new pipeline with an expected service life of 50 – 75 years.
- Completely eliminates a visual impairment of the natural landscape on a park "scenic route."

Disadvantages:

- Highest "installed cost," compared to other Alternatives.
- Use of heavy equipment is required, which will create a temporary scar on the landscape.
- Construction work will be noisy and create a temporary impact to the "soundscape."

- Brief service interruptions will occur when the pipeline is connected to the water system.
- New equipment requires additional periodic maintenance and replacement.
- Introduces a new fuel storage area, with associated spill risks.
- Increases annual operating costs for the park (monitoring, maintenance, and electrical/fuel consumption).

## MITIGATION MEASURES

Mitigating measures will be developed and incorporated into each of the alternatives to minimize the degree and/or severity of adverse effects, and they would be implemented during construction under any of the alternatives, as applicable:

- Construction zones will be identified and fenced with construction tape, snow fencing, or some similar material prior to any construction activity. The fencing would define the construction zone and confine activity to the minimum area required for construction.
- All areas disturbed during construction will be re-contoured following construction. Some revegetation will occur naturally, but some seed would be placed in the larger disturbed areas. Disturbed areas would be surveyed for weeds for several years after construction is completed; any weeds would be removed immediately.
- Sources of fill material will be inspected by park staff to ensure that they are free of weeds.
- Standard measures such as silt fences, vertical mulch, and/or sand bags would be used to minimize the potential for soil erosion.
- Dust will be controlled by water tenders, who will work alongside the trenching machine.
- To reduce noise and exhaust emissions, construction equipment will not be permitted to idle for long periods of time.
- Some petrochemicals from construction equipment could seep into the soil. To minimize this possibility, equipment would be checked frequently to identify and repair any leaks.
- Vegetation impacts and potential compaction and erosion of bare soils would be minimized by conserving topsoil in windrows. The use of conserved topsoil would help preserve micro-organisms and seeds of native plants. The topsoil would be re-spread in as near as original location as possible, and supplemented with scarification, mulching, seeding, and/or planting with species native to the immediate area. This would reduce construction scars and erosion.
- In the event a void is encountered during the construction of the pipeline, work would cease immediately and the contractor would notify the park's Cave Specialist to allow further examination of the void. After examining the void, the Cave Specialist would provide further instructions to the Contracting Officer and Project Leader on how to best mitigate the impacts.
- All protection measures including those to protect workers, park employees, and natural and cultural resources, would be clearly stated in the construction specifications.

Workers would be instructed to avoid conducting activities beyond the construction zone, as defined by the construction zone fencing.

- Construction would take advantage of previously disturbed (e.g. existing pipeline route) areas wherever possible. Soils within the project construction limits would be compacted and trampled by the construction equipment and workers. Soils would be susceptible to erosion until re-vegetation takes place. In an effort to avoid introduction of exotic plant species, no hay bales would be used for erosion control. Hay often contains seed of undesirable or harmful alien plant species. Therefore, on a case-by-case basis the following materials may be used for any erosion control dams that may be necessary: rice straw, straws determined by NPS to be weed-free (e.g., Coors barley straw or Arizona winter wheat straw), cereal grain straw that has been fumigated to kill weed seed, and wood excelsior bales. Standard erosion control measures such as silt fences and/or sand bags would also be used to minimize any potential soil erosion.
- Revegetation plantings would use only native plant seed. Any plant materials salvaged from the project site, such as yuccas and shrubs, will be stored at materials quarry, watered and replanted after construction is completed. Objectives of the re-vegetation efforts would be to reconstruct the natural spacing, abundance, and diversity of native plant species.
- Should construction unearth previously undiscovered archeological resources, work would be stopped in the area of any discovery and the park would consult with the state historic preservation officer and/ or tribal historic preservation officer and the Advisory Council on Historic Preservation, as necessary, according to §36 CFR 800.13, Post Review Discoveries. In the unlikely event that human remains are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (1990) would be followed.
- Cultural Resources: Protective Measures Stipulations: 1) Project area has been inventoried and is to be monitored by an archeologist at least once during and once after the pipeline removal and trench excavation. The area of the lithic scatter near the project will be monitored during all construction operations within fifty feet of the locale. 2) Avoidance of all known and field identified Cultural Resources against destruction, obliteration, removal or damage, in accordance with the requirements of the National Historic Preservation Act of 1966 (36 CFR 800.3). If previously unknown archeological resources are discovered during implementation of a project, all work in the immediate vicinity of the discovery shall be halted and the procedures of 36 CFR Part 800.13(c) shall be followed. In the event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during project implementation, the regulations implementing the Native American Graves Protection and Repatriation Act (NAGPRA; 43CFR Part 10) shall be followed. 4) Equipment yards will be within existing paved lots or in previously disturbed areas such as pullouts. 5) Should equipment move accidentally outside the approved corridor or approved staging areas, project inspector will report the incident, and a cultural resource specialist shall conduct a damage assessment, and devise remediation. 6) Cultural resource site location information will be kept confidential. All access to information regarding the location of cultural resources will be restricted to those employees on a need to know basis.

- Driving and parking of construction equipment will be limited to the 50-foot pipeline corridor, areas already disturbed (e.g. existing parking lots), or pull-outs assigned for staging of materials and equipment.
- Before and after photo documentation would be completed within or adjacent to the project area, and added to the park's permanent records. This record will help evaluate cumulative impacts in the future.
- Vehicle traffic on Scenic Loop road would be allowed as much as possible during the construction period. Construction delays would normally be limited to 30 minutes. There may be some periods when the nature of the construction work may require temporary road closures. All efforts would be made to reduce these closures as much as possible and to alert park staff as soon as possible if delays longer than normal are expected. Visitors would be informed of construction activities and associated delays. Traffic would be managed to ensure timely access to the park.
- Contractors would coordinate with park staff to reduce disruption to normal park activities. Equipment would not be stored along the roadway overnight without prior approval of the contracting officer. Construction workers and supervisors would be required to attend mandatory park resource orientation sessions to learn about the special sensitivity of park values, regulations, and appropriate litter and trash control measures.
- The Park Service would ensure that all contractors and subcontractors are informed of the penalties for illegally collecting artifacts or intentionally damaging archeological sites or historic properties. Contractors and subcontractors would also be instructed on procedures to follow in case previously unknown archeological resources are uncovered during construction. Equipment traffic would be minimized in the area of the site. Equipment and materials staging areas would also avoid known archeological resources.
- Construction workers and supervisors would be informed about threatened and endangered species. Construction will cease if a species is discovered in the project area. Park Biology staff will evaluate the situation and advise the Contracting Officer.
- Construction would cease when wind is 20 mph or greater, in order to reduce impacts to air quality.
- A complete survey for federally listed plants would be conducted before any work commences. If any of the plants are found, the park would engage in consultation with the U.S. Fish and Wildlife Service and mitigation measures would be needed to protect them from damage.
- When work approaches areas known to have federally listed plants, they will notify park Resource Management staff in advance. Biologists will use GIS maps of surveyed plant locations to implement the protection effort. They will mark sensitive areas and individual plants (for avoidance) before the crew works in the area.
- Monitoring: A biological monitor would accompany the construction crew when they are working in areas with the listed plants present. Follow-up monitoring of the plants' condition, including being inundated with dust, would be carried by biologists after the project.

- Crew Orientation: Resource Management staff would also provide orientation briefings to the work leaders and crews before the project. Briefings will discuss the importance of the park's rare, threatened, and endangered plants and work methods that must be used to avoid damaging them.

- If the project is conducted in the off-season for breeding, then most impacts to wildlife would be avoided. If not, professional biologists using a nest search protocol would determine if there are nesting bird species in the area and disturbance near those nests would be avoided.

- If the projected is conducted outside of winter, a qualified biologist would be on site throughout the project to monitor the open trench and remove trapped wildlife. If the project is conducted during winter, a qualified biologist would be on site before and during the work to mitigate damage by relocating hibernating animals.

- Conduct the activity outside the local nesting season so there are no active nests of birds that may be inadvertently damaged or destroyed by the project actions, and no need to conduct surveys for active nests.

- Minimize the loss, destruction, or degradation of migratory bird habitat during the local nesting season if activities must occur during that time frame. Within the Southwest Region, although most species nest between early April and mid-August, some nesting activity may occur during all months of the year depending on location. In desert regions, for example, nesting may begin in January and continue into November. Some eagles, owls, and finches may nest in mid-winter.

- If a proposed project or action might take migratory birds through disturbance or alteration of nesting habitat, and work cannot occur outside the local nesting season, project proponents should provide the USFWS with an explanation for why work has to occur during the migratory bird nesting season. In these cases, project proponents should also demonstrate that all efforts to complete the work outside the migratory bird nesting season were attempted, and that the reasons work needs to be completed during the nesting season were beyond the proponent's control.

- To determine if migratory birds are nesting on-site and therefore potentially at risk by the activity, project proponents should conduct initial general surveys of the project area during the best biological time frame for detecting the presence of the locally nesting birds (to locate potential territories that may be in harm's way), followed by nest searches in the project area shortly before the disturbance will occur (ideally within a week of the start of construction due to the speed with which nests may be built).

- Except for the nests of large species, bird nests are well hidden and very difficult to find, and nest searches can be time-intensive. Surveyors must be experienced in locating nests, as doing so successfully often relies on the ability to interpret subtle behavioral cues by the adult birds. Project proponents should also be aware that results of migratory bird

surveys are subject to spatial and temporal variability and should be conducted at the most appropriate times of day and season for detection of territories and ultimately nests.

- If no migratory birds are found nesting in the proposed project or action areas immediately prior to the time when construction and associated activities are to occur, then the project activity may proceed as planned.

- If protected species of birds are present and nesting in the proposed project or action area when project activities are slated to occur, contact the USFWS Ecological Services Field Office and the USFWS Regional Division of Migratory Birds for guidance on appropriate next steps for minimizing risk of violating the MBTA.

## ALTERNATIVES CONSIDERED BUT DISMISSED

The following alternative was considered but was eliminated from further analysis. Reasons for the dismissal are given below.

An alternate site was considered for locating the buried water line. This alternative location would situate the trench under the Scenic Loop Road or immediately adjacent to the Scenic Loop Road. After extensive discussion among the Interdisciplinary Team (IDT), the alternative site was dismissed based on the following information: a larger area of potential effect (i.e., doubling the original amount of impacted area) that would be required, which would impact significantly more cultural and biological resources, create a new area of disturbance requiring additional, expensive trench work due to vehicle/road compaction requirements, and would extend the length of the pipeline by several hundred feet. This would ultimately increase the costs for engineering, mitigation and construction.

## ENVIRONMENTALLY PREFERABLE ALTERNATIVE

Council on Environmental Quality (CEQ) regulations (43CFR46.30) define the environmentally preferable alternative as the alternative "that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources. The environmentally preferable alternative is identified upon consideration and weighing by the Responsible Official of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources. In some situations, such as when different alternatives impact different resources to different degrees, there may be more than one environmentally-preferable alternative."

**Alternative D** (burying the pipeline) is the environmentally preferable alternative for several reasons; 1) This alternative enhances cultural resources by removing the existing above-ground pipeline from the historic landscape; 2) While there would be some new ground disturbance that would affect previously undisturbed elements of the biological and physical environment, burying the pipeline would reduce the impacts to visual resources and the viewshed; 3) the pipeline would last 50 or more repair-free years, which exceeds the other alternatives in terms of longevity. Maintenance costs (including time, equipment and materials) would be reduced as a result.